

DEC 5 1938

AUTOMOTIVE INDUSTRIES

LAND — AIR — WATER

DECEMBER 3, 1938



• These New Departure Spindle Bearings went to work in a new tool room lathe.* That was ten years ago. They didn't want a soft job—and they didn't get it. Year after year, two and three shifts a day, they were kept at work, much of it at high speeds with carboloy tools. Except for lubri-

* Details upon request.

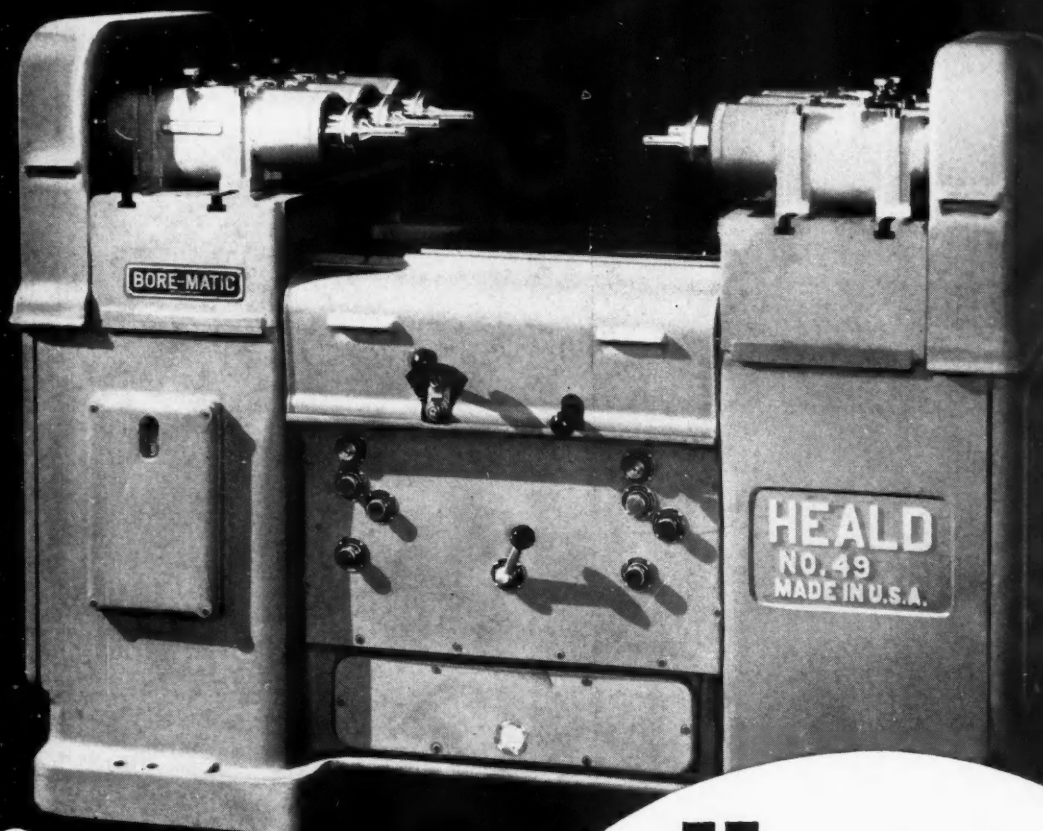
cation, they received no attention whatsoever. In ten years they had accomplished work that normally would require over twenty years time. They were mighty good bearings but today New Departure makes them still better—more accurate—fit components for the finest of machine tools.

2

NEW DEPARTURE Ball Bearings

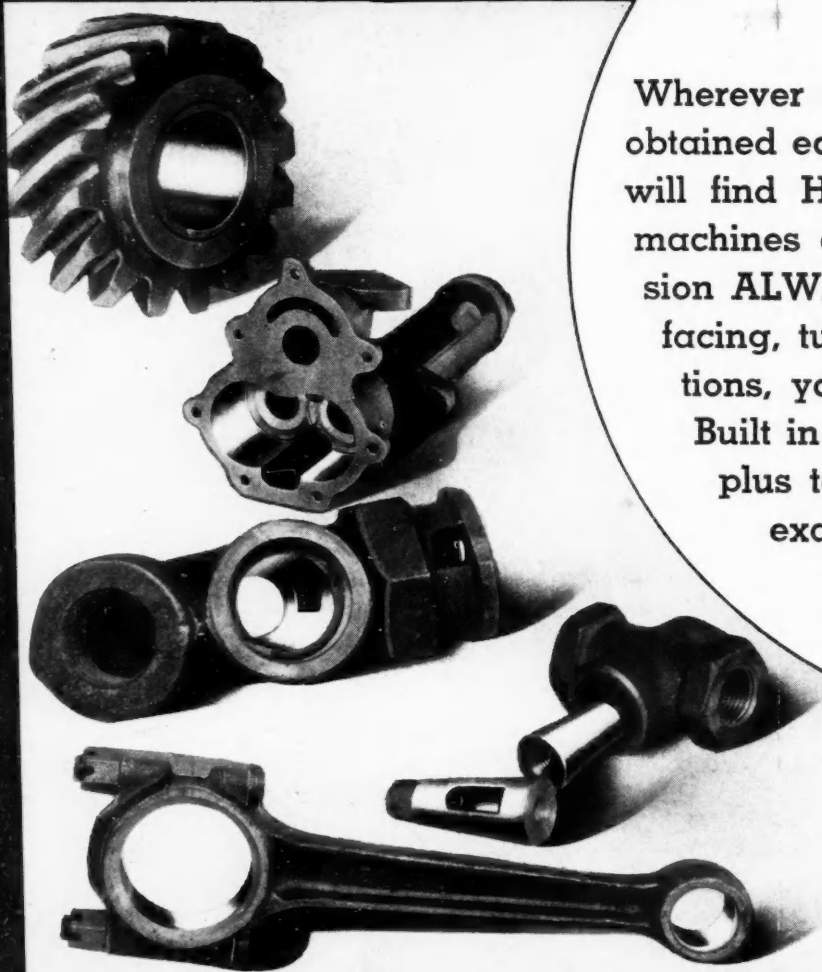
New Departure • Division General Motors Corporation • Bristol, Connecticut

NOTHING ROLLS LIKE A BALL



Precision **all-ways**

Wherever high accuracy and finish must be obtained economically, the chances are that you will find Heald Bore-Matics on the job. These machines are designed not only to give precision **ALWAYS** but in **ALL WAYS**. For boring, facing, turning, grooving or multiple operations, you will find them equally efficient. Built in a wide range of types and sizes plus tailor made fixture equipment to exactly suit your requirements, whether mass, medium or limited production.

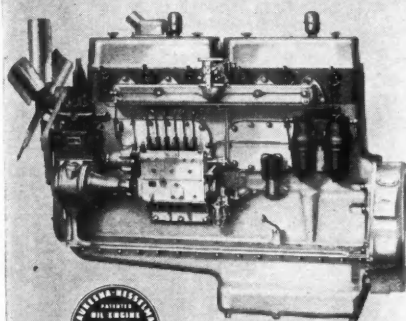
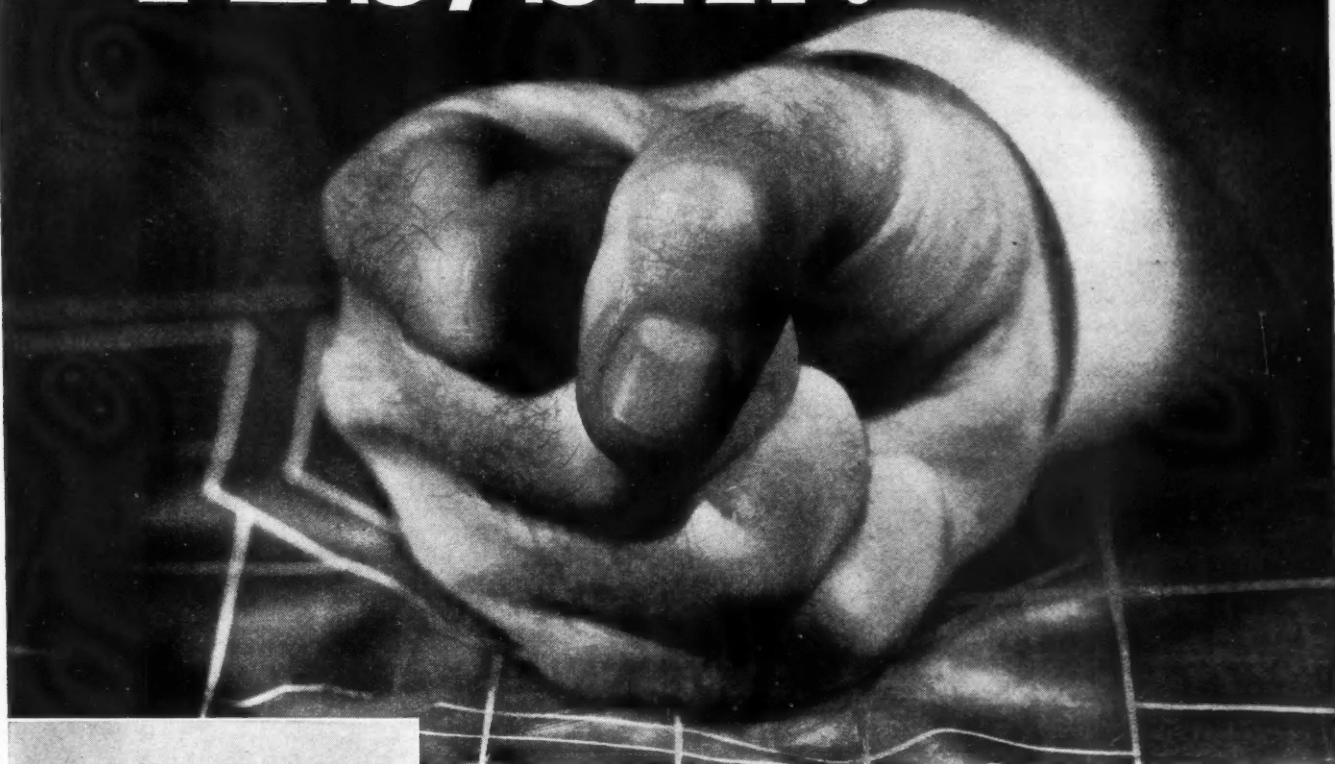


At the left are a few typical examples of the many parts that can be readily Precision Bored, Faced or Turned with Heald Bore-Matics.

The HEALD Machine Company

WORCESTER, MASSACHUSETTS, U. S. A.

"YES, SIR!



WAUKESHA HESSELMAN OIL ENGINES

**FOR THE GREATEST
OVER-ALL ECONOMY**

... when they put a spark plug in an oil engine THEY DID SOMETHING"

"... and a good many of these Diesels would work a whole lot better, too, if *their* ignition was definitely timed. Spontaneous combustion ... uncontrolled ... is a mighty sensitive thing. Just changing from one barrel of fuel oil to another ... even with the same label and from the same company ... can affect the operation of my Diesels. And when my trucks are on cross-country runs, do I have grief!

"Now, you take that Hesselman Engine. It's got spark plug ignition. Fires right on the dot ... just when the maker intended it to. And it doesn't take any 500 or 600 pounds compression pressure for ignition either. In goes the whole blasted charge *at once* ... it's mixed and burned smoothly ... *all* of it.

"Try and do that with a Diesel. When the charge ignited, you'd like as not blow off the heads, strip the studs, away would go the gaskets, and it would be just too bad for the bearings—if you didn't break the crankshaft.

"I can't be following my trucks all over with a fuel lab. to guard against lazy diesel oil, and besides, cold starting almost always raises hob anyhow.

"Yes, sir, that spark plug is the best thing they've done for oil engines since they started making 'em. And that's what makes this engine so good for my trucks."

He's right. Using a spark plug instead of great pressure to ignite the fuel gives the Waukesha-Hesselman Oil Engine *easiest starting, snappy acceleration, low mechanical upkeep—with any of the modern diesel fuels.* Bulletin 1011 explains all these advantages—*write for it.*

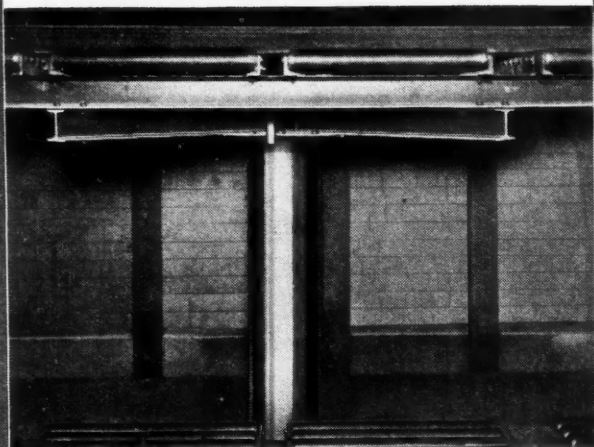
WAUKESHA MOTOR COMPANY, WAUKESHA, WISCONSIN
NEW YORK . TULSA . LOS ANGELES

THIS IS NO. 5 OF A SERIES ON THE WAUKESHA-HESSELMAN OIL ENGINES

Curtis

HYDRAULIC CYLINDERS

**provide Fast, Safe
Low-Cost Lifting**



If you have materials to be raised or lowered to different levels the job can be done quickly, accurately and economically with Curtis Hydraulic Cylinders; operated by compressed air (or electric oil pump). Their simplicity and dependability means maximum lifting efficiency, and years of trouble free, low-cost service. These Curtis advantages will save you money, right from the day of installation:

- First cost is low
- Instant accurate control
- Inexpensive to operate
- Maintenance is negligible
- Installation is simple
- Regular shop air lines used
- Anyone can operate
- Safely oil-locked at all heights
- Capacities up to 10 tons

Check your plant to see where Curtis Hydraulic Cylinders can serve you. Send coupon for new Free booklet, listing many profitable applications of air and hydraulic equipment.

CURTIS Compressors • Air & Hydraulic Cylinders
Air Hoists • I-Beam Cranes & Trolleys

CURTIS PNEUMATIC MACHINERY COMPANY
1917 Kienlen Avenue, St. Louis, Mo.
Gentlemen: Please send data on Curtis Hydraulic Cylinders, and your 28-page booklet, "How Air is Being Used in Your Industry."

Name _____

Firm _____

Street _____

City _____

State _____

AUTOMOTIVE INDUSTRIES

THE AUTOMOBILE

Reg. U. S. Pat. Off.
Published Weekly

Volume 79

Number 23

JULIAN CHASE, Directing Editor
HERBERT HOSKING, Editor
P. M. HELDT, Engineering Editor J. B. POLLOCK, Ass't Editor
JOS. GESCHELIN, Detroit Technical Editor MARCUS AINSWORTH, Statistician
J. A. LAANSMA, Detroit News Editor HOWARD KOHLBRENNER, Art Editor
JEROME H. FARRIS, Ass't Editor L. W. MOFFETT, Washington Editor
H. E. BLANK, JR., Ass't Editor JAMES G. ELLIS, Washington Editor
B. M. IKERT, Contributing Editor

CONTENTS

News of the Industry	713
Precision is Basic in the IHC Engine Plant. By Joseph Geschelin	724
Progress in the Oil Industry. By J. Howard Pew	737
Diesel Engine Designed for 3-Ton Dodge	740

Departments in the News

Summary of Production Activity	Publications Available
Ourselfs and Government	Men of the Industry
Advertising News Notes	Chart of Production Activity
Business in Brief	Tools of Tomorrow
Automotive Metal Markets	Automotive Abstracts
40 Years Ago	Calendar of Coming Events
Advertisers' Index	59

Copyright 1938 by Chilton Company (Inc.)

C. A. MUSSELMAN, Pres.; J. S. HILDRETH, Vice-Pres. and Manager, Automotive Division; G. C. BUZBY, Vice-Pres.

OFFICES

Philadelphia—Chestnut & 56th Sts., Phone Sherwood 1424
New York—239 W. 39th St., Phone Pennsylvania 6-1100, Chicago—Room 916, London Guarantee & Accident Bldg., Phone Franklin 9494, Detroit—1015 Stephenson Bldg., Phone Madison 2090, Cleveland—609 Guardian Bldg., Phone Main 6860, Washington—1061 National Press Bldg., Phone District 6877, San Francisco—444 Market St., Room 305, Phone Garfield 6788, Long Beach, Cal.—1595 Pacific Ave., Phone Long Beach 613-238.
Cable Address Autoland, Philadelphia

SUBSCRIPTION RATES: United States, United States Possessions, and all Latin-American countries, \$1.00 per year; Canada and Foreign, \$2.00 per year. Single Copies this issue, 25c.

Member of the Audit Bureau of Circulations
Member Associated Business Papers, Inc.

Entered as second-class matter Oct. 1, 1925, at the post office at Philadelphia, Pa., under the Act of March 3, 1879.
Automotive Industries—The Automobile is a consolidation of the Automobile (monthly) and the Motor Review (weekly), May, 1902; Dealer and Repairman (monthly), October, 1903, the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

Owned and Published by



CHILTON COMPANY
(Incorporated)

Executive Offices

Chestnut and 56th Streets, Philadelphia, Pa., U. S. A.

Officers and Directors

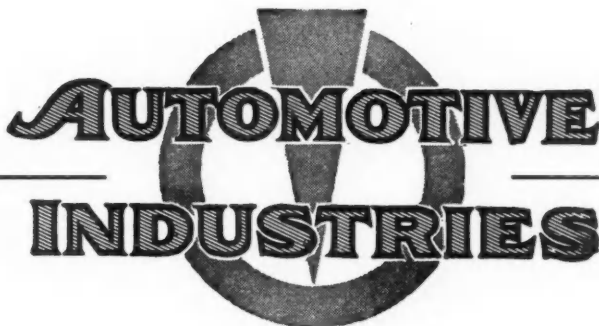
C. A. MUSSELMAN, President
FRITZ J. FRANK, Executive Vice-President
FREDERIC C. STEVENS, JOSEPH S. HILDRETH, GEORGE H. GRIF-
FITHS, EVERIT B. TERHUNE, Vice-Presidents; WILLIAM A. BARBER,
Treasurer; JOHN BLAIR MOFFETT, Secretary; JOHN H. VAN DE-
VENTER, JULIAN CHASE, THOMAS L. KANE, CHARLES S. BAUR,
G. CARROLL BUZBY, P. M. FAHRENDORF.

December 3, 1938

When writing to advertisers please mention Automotive Industries

Automotive Industries

AUTOMOTIVE INDUSTRIES, Vol. 79, No. 23. Published weekly by Chilton Co., Chestnut & 56th Sts., Phila. Entered as Second-Class Matter October 1, 1925, at the Post Office at Philadelphia, Pa.; Under the Act of Congress of March 3, 1879. In Case of Non-Delivery Return Postage Guaranteed. Subscription price: United States, Mexico, United States Possessions, and all Latin-American countries, \$1.00 per year. Canadian and Foreign, \$2.00 per year; single copies, 25 cents, except Statistical Issue (Feb. 26, 1938), 50 cents.



Published Weekly

Founded 1895

Vol. 79, No. 23

December 3, 1938

News of the Industry

INDUSTRIAL ECONOMICS

● If and when the Administration establishes a Bureau of Industrial Economics, whose job would be to guide industry in balancing production with consumption, the Federal Trade Commission wants to take it under its wing.

This, in effect, is what the FTC told Congress in its annual report released on Wednesday. President Roosevelt from time to time has toyed with the idea, of which Donald R. Richberg, former NRA Administrator, is the most persistent advocate. Recent reports also have coupled Leon Henderson, secretary of the Temporary National Economic (anti-monopoly) Committee with the sponsorship of such a bureau on the assumption that the work mapped out for the TNEC is too big a job for the time allotted and that it eventually would have to be taken over by another agency, presumably a set-up similar to an Industrial Economics Bureau. Reports have it that Mr. Henderson would like to head such a Bureau.

Mr. Roosevelt, it is recalled, has stressed the necessity of bringing production more into line with consumption and in this connection has referred specifically to the automobile industry. The FTC said in its report that the project of compiling information on market conditions was conceived "as a means of improving business conditions by mitigating the severe

changes of the business cycle. Such work, if successful, would benefit industry many-fold the cost of such an undertaking even if it ran into a comparatively large amount, the Commission said.

GOVERNMENT PURCHASES

● Government purchase of transportation equipment, as reported by the Public Contracts Board for the week ended Nov. 26, totaled \$228,261. The awards were:

For trucks—Mack International Motor Truck Corp., Philadelphia, \$11,060; engine parts—Wright Aeronautical Corp., Paterson, N. J., \$202,800; adapter assembly—Aerial Machine & Tool Corp., New York City, \$11,401; tractors—Allis-Chalmers Mfg. Co., Milwaukee, Wis., \$16,042.

Miscellaneous awards announced during the same period: For thread machines—Jones & Lamson Machine Co., Springfield, Vt., \$23,016; boring, drilling and milling machine—Henry Prentiss & Co., Inc., Boston, Mass., and Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., \$22,338; vertical boring mills—The Bullard Co., Bridgeport, Conn., \$39,554; precision, jig boring machine—Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn., \$12,478; tires and tubes—The B. F. Goodrich Co., Akron, Ohio, an indefinite amount; tires and tubes—The Wabco Co., Chicago, an indefinite amount.

Production

Output and Sales Continue at Gratifying Rate

With another boost in the average daily rate, car and truck production for the week ending December 3 will show the highest total for any week in 1938 according to an estimate based on a mid-week check of factory schedules.

The week's total output should be approximately 101,500 cars and trucks as compared with 81,400 for the previous week, which suffered the loss of one day's work because of the Thanksgiving holiday. Increases at Ford, several of the Chrysler divisions, and Nash, were largely responsible for the current rise in daily output, although General Motors divisions and most of the other independents were maintaining the increased rates previously announced.

The production picture for the balance of December continues to look bright as factories almost universally report a steady demand from dealers for more cars. Dealer stocks on the average are still considerably below what they were a year ago and sales reports covering the second 10 days of November show sales well ahead of the same period last year. In several instances sales are ahead of the same period in 1936.

Paced by Chevrolet the various General Motors divisions continued to account for the largest portion of the week's total with an estimated output of 42,700 cars and trucks. Chrysler divisions, with important increases at Plymouth and Dodge were expected to turn out about 22,750 cars and trucks, approximately the same total achieved by Ford with the V-8, Mercury and Lincoln Zephyr lines. In the independent field, Hudson and Nash were running close together, followed by Packard, Studebaker and Willys.

On the basis of the current week's estimate total production for November should be approximately 385,000 cars and trucks.—J. A. L.

AUTOMOTIVE INDUSTRIES

Summary of Automotive Production Activity (Week Ending Dec. 3)

BUSES

One of the largest producers currently operating at about 50 per cent reported a drop to 44.3 per cent this week. The drop was said to be due to the engineering work necessary on receipt of orders before production is started, and upward revision is expected shortly. Several large inquiries were reported this week, presumably a first step in plans to provide for 1939 World Fair travellers.

TRUCKS

Reports indicate sales pick-up in all sections of the country with larger fleets among the best buyers. One producer states it is unable to keep pace with incoming orders. Another large manufacturer, recently slowed down for inventory, says new orders will boost production rate considerably. Reports from all sources indicate gradual strengthening of deliveries since the National Truck Show.

TRACTORS

Situation remains about the same as over the past several weeks, with indications of general production boost after the first of the year.

AUTOMOBILES

Production for this week estimated at 101,500 units to show the highest total for any week this year. Dealer demand is well up and high output rate is expected to continue through December.

MARINE ENGINES

Optimistic feeling as there is considerable activity in governmental and private inquiries. Seasonal lull is emphasized by imminence of National Motor Boat Show.

AIRCRAFT ENGINES

Production of standard models and experimental work continues at high rate. One producer expected to put into operation a second production line early next year.

This summary is based on confidential information of current actual production rates from leading producers in each field covered. Staff members in Detroit, Chicago, New York and Philadelphia collect the basic information, in all cases from official factory sources.

(Copyright 1938, Chilton Co., Inc.)

News of the Industry

MONEY MATTERS

The Reconstruction Finance Corp., has officially advised S. L. Davis, president, Hupp Motor Car Corp., that a loan of \$900,000, the full amount requested, has been formally approved. The money will be made available immediately.

This loan makes possible the completion of other financing plans which, with the money to be secured from the sale of certain excess plants and machinery, will provide Hupp with over \$2,000,000 of additional working capital—all that is required to immediately expand production facilities for the Hupp Skylark, it is said.

• Directors of The Goodyear Tire & Rubber Co. of Canada, Ltd., New Toronto, Ont., have declared an extra dividend of \$5 a share on the common stock. They have also declared a regular quarterly dividend of 63 cents a share on the common and regular quarterly 1¼ per cent on the preferred. There are 120,000 preferred shares (\$50 par value) and 257,260 common shares (no par value) outstanding. On the common stock the company paid an extra dividend of \$2.50 a share on January 15, 1937. The company's fiscal year ends December 31.

• More failures per month occurred in the automobile industry during the first ten months of 1938 than in any previous year since 1933, according to a report by Dun & Bradstreet, Inc. For manufacturers and distributors combined, the total for the ten months amounted to 446, while in the full twelve-month period of 1937 the total was 305.

An increase of bankruptcies of wholesalers and retailers, states the report, was responsible for the high figure in 1938; the monthly average for this group in the January through October period was 41, almost double the 1937 figure, and the largest for any year since 1933.

• Motor vehicle financing in Canada during October showed increases of seven per cent in number and five per cent in dollar volume over the corresponding month of last year. Number and volume of new and used vehicles financed were 11,192 at \$4,525,173 in October against 10,491 at \$4,323,293 in the same month last year. This increase, the first to be recorded this year, is due to marked increases which took place in the prairie provinces over the corresponding month a year ago.

Totals for the first 10 months reflect decreases of 10 per cent in number and nine per cent in volume below the same period of 1937, 142,207 vehicles have been financed for \$60,969,228 against 158,748 for \$67,013,138 in the first 10 months of 1937. New vehicle financing during the first 10 months was 21 per cent below figures for the similar period of 1937, while used vehicle financing was down only six per cent.

TAX TAKES

• On every tire bought in the United States, the motorist pays 10 major hidden taxes totaling 8 per cent of the purchase price of the average tire, a study by R. C. Guy, treasurer of the Fisk Rubber Corp., revealed.

On a four-ply 6.00 x 16 tire, the taxes are listed as follows: 11 cents on raw materials; 15 cents on the wholesale price; 16 cents on the consumer's price; 26 cents vendor's tax; and 56 cents excise tax.

Since 1933, it was pointed out, the excise tax alone has jumped more than \$15,000,000 on tires and tubes, reaching

\$40,088,004 last year. On a single tire it is nearly equivalent to all other taxes combined.

Total taxes now paid by the consumer amount to about \$5 per set of tires for the average passenger car, the study showed.

• Excise tax collections for October as announced by the Treasury Department were as follows:

	October 1938
Automobile trucks	390,817
Automobiles and motor cycles..	1,207,351
Auto. parts and accessories.....	688,367
Tires	2,223,831
Inner tubes	442,930
Lubricating oils	2,351,453
Gasoline	18,423,802

Collections for the same month in 1937 were:

	October 1937
Automobile trucks	805,749
Automobiles and motor cycles..	4,312,775
Auto. parts and accessories.....	972,803
Tires	2,953,205
Inner tubes	585,035
Lubricating oils	2,581,168
Gasoline	18,267,971

TO CORRECT

EDITOR, AUTOMOTIVE INDUSTRIES:

I wish to call attention to an error which appeared in Mr. Heldt's paper on "New Developments in High Speed Diesels, Part Two," in the Nov. 26 issue of AUTOMOTIVE INDUSTRIES.

In regard to the Adolphe Saurer automatic timing device as applied to their models CCD and CDD Diesels, it is stated that the governors' sliding member can be slid axially by the governor weights rotating with the sleeve and, a few lines later, "With a change in speed of the crankshaft and of the sleeve driven by it the governor weights move outward from the axis of rotation, and through suitable connection move the slidable member lengthwise relative to the sleeve." The inference is that the governor moves the sleeve by a purely mechanical motion, whereas actually the work of sliding the sleeve is done by a hydraulic servo, the oil pressure from the engine lubricating system acting against a piston attached to the forward part of the movable sleeve and the cylinder in which it works formed by the outer sleeve. Within an extension of the piston is a small-bore tube, suitably ported, in which is a valve that is slid in an axial direction by suitable linkage by action of the governor. When the speed of the engine increases this valve opens ports connecting the oil supply with this cylinder, which causes the piston to move back, and the helical splines referred to advance the injection. The motion of the piston is opposed by a coil spring in the axis of the sliding member and the balance between oil pressure and spring pressure determines the degree of advance. With reduction in speed, the valve moves forward, under governor action, permitting oil to escape from the cylinder, the sleeve is returned under spring pressure to the retard position, or until a new balance is reached with the lowered oil pressure, according to the position of the governor and valve.

Please refer to your article, "Saurer Diesel for Light Vehicles," which appeared in the Sept. 26, 1936, issue of AUTOMOTIVE INDUSTRIES.

W. KNOUFF

Wage-Hour Act

Consent Decrees May Be Used as Precedents for Rules

Prompted by the receipt of some 1200 complaints alleging violations of the Wage-Hour Act, Administrator Andrews has moved to set enforcement machinery into motion for the first time since the law became effective Oct. 26. The Wage-Hour Division of the Labor Department is expected to select the most flagrant cases of violation and submit them to the Department of Justice for prosecution.

At the same time, possibility of court challenge was seen in the announcement by Andrews that the Division regards as illegal any attempt by employers to reduce wages already above the 25-cent minimum down to the bare minimum. Andrews cited Section 18 of the law which provides that "no provision of this Act shall justify any employer in reducing a wage paid by him which is in excess of the applicable minimum wage under this Act, or justify any employer in increasing hours of employment maintained by him which are shorter than the maximum hours applicable under this Act." He conceded this provision should be clarified to the extent (Turn to page 719, please)

Stainless Steel Ignition Cable

A high-tension ignition cable of stainless steel, designed to reduce battery drain and increase the life of spark plugs, has been developed by a Bureau of Standards scientist for use in automobiles and airplanes.

The cable, composed of several strands of stainless steel wire and about one-third the diameter of the conventional ignition cable, has been tested for six years and is now being used by the Navy. Dr. Melville F. Peters, senior physicist at the Bureau of Standards, who developed the cable, describes it this way:

The ignition cable connecting spark plugs, distributor and ignition coil was developed on the theory that the greater the capacitance (the electro-relationship between the circuit and the engine and other metal parts of the body), the greater is the energy required of the battery. In most ignition systems the greatest part of the capacitance is due to the high tension ignition cable. By reducing the size of the wire, the capacitance of the cable is decreased, less energy is required from the ignition coil, and consequently less energy is drawn from the battery.

By using a high-resistance con-

ductor, spark plug wear is reduced by eliminating or damping out all oscillations other than the major ones causing the initial sparks, which continue for about one-millionth part of a second and consist of from 10 to 14 oscillations. Measurements show that current discharges of 30 to 80 amperes occur across spark-plug electrodes. The heat transfer from the spark plugs to the rubber insulation is reduced by using a wire which is a poor conductor of heat; and because the cross-sectional area of the conductor has been reduced by about one-third, a sufficiently strong wire must be used to permit drawing it through the insulating conduit.

Dr. Peters states that stainless steel satisfied all of the four requirements.

The cable is now being manufactured for commercial use and has, although not widely known, been on the market for several months.

Current Interest in Foreign Trade

U. S. Delegates at Peru Conference; ASA Promotes Argentine Representative; AMA Discusses British Pact

Peru Conference

United States delegates to the eighth Pan-American Conference, whose work may go far in strengthening relations and increasing trade with the South American countries, sailed last Friday, bound for Lima, Peru, where the conference begins Dec. 9.

Chairman of the United States delegation is Secretary of State Cordell Hull, father of the Administration's reciprocal trade agreement program, who said in New York before sailing:

"I personally am anticipating the opportunity to work again with my friends of the other American republics, as I have had the pleasure

of doing at two previous conferences, to forward our program of elaborating measures of mutual benefit and of advantage for the welfare of the American peoples.

"Our country happily maintains cordial and friendly relations with all of the other American nations. Our representatives will meet the delegates from the other American republics in a spirit of sympathetic give and take. While naturally giving every attention to the interests of the United States, they will work on the principle that what is for the good of all is to the advantage of each."

ASA Argentine Representative

In line with the awakened consciousness of the United States South American trade, the American Standards Association is to appoint a permanent staff representative in Buenos Aires. A conference this past summer of many organizations interested in trade with South America recommended to the ASA board of directors that the association arrange for an Argentine representative.

The ASA board of directors at its meeting Sept. 28 decided to appoint such a representative, contingent upon the guarantee of sufficient funds to support the work by the concerns interested in the project, to cooperate with the Argentine national standardizing body and the U. S. Chamber of Commerce in promoting the use of American industrial standards. A committee was appointed to draw up a tentative budget and to determine whether and from what sources financial support may be forthcoming.

The fact that British, German and other interests have for some time been active in encouraging adoption of their standards had already brought forth suggestions from the U. S. Chamber of Commerce at Buenos Aires that American interests should be represented. It was pointed out that Argentina, primarily an agricultural country, is the market for many American-made products. With the exception of Canada, it provides the leading outlet for motor trucks. Both General Motors and Ford have assembly plants there.

J. Seward McCain, of the Business Publishers International Corp., (Turn to page 722, please)

Passenger Car Exports Increase in October

Exports of passenger cars and chassis were quadrupled in October as compared with September of this year. As indicated in the table below, this country exported 10,822 passenger cars and chassis this October. This, however, represented a decrease of approximately 37 per cent from the exports in October, 1937. Cumulative exports for the ten months ended Oct. 31, 1938, also showed a decrease, approximately 32 per cent, from the first 10 months of 1937.

	OCTOBER 1938		OCTOBER 1937		TEN MONTHS ENDED OCTOBER			
					1938		1937	
	No.	Value	No.	Value	No.	Value	No.	Value
EXPORTS		\$		\$		\$		\$
Automobiles, parts and accessories.....		17,303,333		25,408,377		215,811,085		277,335,510
PASSENGER CARS								
Passenger cars and chassis.....	10,822	6,712,801	17,199	10,378,716	120,349	75,323,970	177,531	103,235,009
Low price range \$850 inclusive.....	9,364	5,190,477	15,551	8,681,152	105,058	58,781,067	162,431	86,568,239
Medium price range over \$850 to \$1,200.....	1,273	1,218,865	1,492	1,394,598	13,051	12,706,922	12,519	11,843,598
\$1,200 to \$2,000.....	159	236,730	83	121,666	1,751	2,596,128	1,855	2,941,057
Over \$2,000.....	26	66,729	73	181,300	489	1,239,853	728	1,982,115
COMMERCIAL VEHICLES								
Motor trucks, buses and chassis (total).....	6,081	4,075,491	8,300	6,680,776	93,108	60,427,383	131,683	79,671,403
Under one ton.....	521	232,970	692	338,899	13,180	5,623,375	17,133	6,847,573
One and up to 1½ tons.....	4,315	2,276,946	3,724	2,243,126	63,462	35,303,497	85,155	41,976,599
Over 1½ tons to 2½ tons.....	706	600,411	2,703	2,419,364	10,204	8,253,890	21,279	16,783,227
Over 2½ tons.....	503	929,203	1,060	1,548,289	5,107	10,131,630	6,857	13,030,237
Bus chassis.....	36	35,961	121	131,098	1,155	1,114,991	1,259	1,033,767
PARTS, ETC.								
Parts except engines and tires.....		2,163,862		3,161,150		37,080,389		45,523,656
Automobile unit assemblies.....		3,411,804		3,715,015		30,571,007		31,893,439
Automobile parts for replacement (n.e.s.).....		443,085		581,223		3,066,298		3,970,940
Other automobile accessories (n.e.s.).....		474,843		518,476		4,885,328		5,454,211
Automobile service appliances.....								
Airplanes, seaplanes and other aircraft.....	54	2,459,529	61	1,845,597	729	33,846,597	516	17,302,930
Parts of airplanes, except engines and tires.....		1,665,261		1,225,268		18,048,341		8,775,995
INTERNAL COMBUSTION ENGINES								
Stationary and Portable.....								
Diesel and semi-Diesel.....	70	178,193	100	273,567	437	1,775,651	746	1,902,956
Other stationary and portable.....								
Not over 10 hp.....	2,190	94,739	1,155	71,152	13,698	731,629	15,538	910,575
Over 10 hp.....	113	65,488	279	140,761	2,998	1,378,242	2,907	1,398,499
Engines for:								
Motor trucks and buses.....	219	32,903	693	58,046	21,080	2,341,835	27,776	2,743,462
Passenger cars.....	271	21,671	5,596	333,487	32,052	2,609,191	69,777	4,726,797
Aircraft.....	123	777,600	85	531,367	1,074	6,244,856	871	4,783,415
Accessories and parts (carburetors).....		210,882		262,256		2,274,849		2,317,238
IMPORTS								
Automobiles (durable).....	64	30,866	246	146,483	492	322,063	1,736	1,048,606

News of the Industry

ADVERTISING NEWS NOTES

Following up its early announcement of 1939 models in more than 1200 newspapers throughout the country, Plymouth division of Chrysler Corp. is embarking on one of the most intensive advertising campaigns in its career. The company states that 92 per cent of all the daily newspaper circulation in the country is being used.

Dearborn Chemical Co., Chicago manufacturer of rust-preventives for iron, has named Fensholt Co. to direct its advertising for its industrial division. N. D. Buehling is account executive.

Automobiles and trucks, anti-freeze, tires, tire chains, oil and gasoline have upped the recent downward trend of retail advertising.

Chris Craft Corp. is planning an aggressive winter advertising campaign to stimulate sales of motor boats for early spring delivery. Brooke, Smith & French, Detroit, is in charge of the campaign.

Ford Motor Co. took a swing into ancient automobile history and reproduced an old illustrated advertisement of the "Ford-mobile" runabout, in many cases appearing in the same issue of newspapers carrying advertisements of the current models. N. W. Ayer & Son, Inc., is the agency.

Charles F. Kettering, vice-president, General Motors Corp., Mayor Kelly of Chicago, C. W. Galloway, vice-president of the Baltimore & Ohio Railroad, helped to ballyhoo the christening of the railroad's streamlined Capitol Limited last week in Chicago. The new Diesel-powered train is the first with this type of engine to connect the east with the western Diesel units. The locomotive cost \$500,000, or about three times the cost of a standard steam locomotive. The one engine will haul the train through to Washington alone, whereas six steam locomotives have been used on the run. Joseph H. Finn of Reincke-Ellis, Younggreen & Finn, the agency which handles the railroad's advertising between Pittsburgh and the Pacific Coast, planned the sendoff with Richard A. Foley Agency, Philadelphia, the eastern advertising contact.

Charles M. Adell, widely known in the automotive parts industry, has been named manager of the Detroit office of Weed & Co. advertising agency.

Industrial Marketers, Cleveland, awarded its past president, Stanley A. Knisely, advertising manager, Republic Steel Corp., a tribute signed by more than 100 members of the organization. He was recently elected president of the National Industrial Advertising Association.

The new advertising campaign for Castrol motor and gear oils is appearing in key cities in Canada on instructions issued by MacLaren Advertising Company, Ltd., Toronto, Ont. With very little wording, the copy follows poster technique, with a background suggesting ice and snow.

Champion Spark Plug Co. of Canada, Ltd., Windsor, Ont., is advertising on the motor page of the *Toronto Star Weekly*, in a campaign which runs practically every week of the year.

Four of General Motors of Canada, Ltd., Oshawa, Ont., 1939 models are being announced in a single issue of the *Toronto Star Weekly*. A page of color is being used on each car.

Dr. James Shelby Thomas, A.B., A.M., LL.D. was a recent speaker at the Advertising & Sales Club of Toronto. Dr. Thomas is president of the Chrysler Institute of Engineering at Detroit, Mich.,

and is also president of Clarkson College of Technology, Potsdam, N. Y.

Electric Auto-Lite, Ltd., Sarnia, Ont., after an absence from publications for several years has commenced an advertising campaign in automotive papers featuring its new Steelductor cable. For the present advertising will be confined to automotive dealer publicity both in English and French. R. S. Smith & Son, Ltd., Toronto, has been appointed to handle the campaign.

40 Years Ago

Many persons who have decided that they will own motor carriages next season are deferring their orders until the spring in the belief that they will be able then to get delivery in time for the summer outing. This is not a safe assumption. Our manufacturers are swinging into the business at a pretty lively gait, and already orders are being booked several months in advance. From present indications these orders will multiply very fast between now and the first of March, and with the advent of April a small avalanche of business may be expected to meet our pioneer makes. Hence the prudent course for those who wish motor carriages next spring is to place their orders now. Remember that the leading French manufacturers are a year or more behind orders, and that those who possess the coveted machines will be counted fortunate in the motor vehicle year of 1899.—From *The Horseless Age*, December, 1898.

WEST COAST OUTPUT

• The enthusiastic reception accorded 1939 model cars at Pacific Coast automobile shows is being reflected in rising banks of unfilled orders at Los Angeles assembly plants. To meet the growing demand for new cars four of the five plants in the Los Angeles area are now operating at capacity on a five-day week. The fifth plant, Willys-Overland, has not yet started assembly operations but will be under way shortly on its new model output. Other companies with assembly plants at Los Angeles include Ford, General Motors, Chrysler and Studebaker.

The four plants now operating are turning out 3675 finished cars a week.

Ourselves and Government

Wage and Hour Administrator Rules Out Any Variety of "Blue Eagle" Insignia

A weekly check list of legislative, executive and judicial actions affecting the automotive industries. First appeared in June 25 issue, p. 831. Corrected to Nov. 30.

Legislative Legacies

MONOPOLY STUDY. The Temporary National Economic (anti-monopoly) Committee has announced that use, distribution and pooling of patents in the automobile and bottle glass industries will be the first subject taken up by the committee.

LABOR DEPARTMENT

WAGES AND HOURS. A return of any official insignia of the Blue Eagle variety to indicate compliance with the law has been ruled out by the Administrator. Manufacturers and distributors may agree among themselves to use an insignia on goods but the Administrator points out that such labels are no guarantee to the purchaser that he will be free from prosecution or injunction for the violation of Section 15(a), dealing with "hot goods."

The New Congress

Automotive Leaders Interpret the Recent Elections

Leading executives in the automotive field were asked this week by AUTOMOTIVE INDUSTRIES to interpret the results of the recent congressional elections with respect to their own business and with respect to business as a whole. This is what they said:

Alfred P. Sloan, Jr., chairman of the board of General Motors Corp., replied—

"I am of the opinion that there has been developing, for some time past, a realization, on the part of more and more people, that there is something wrong, somewhere. Naturally, such thinking must start with those groups which have a better understanding of the intricate problems involved and then gradually spread among an increasing number, as the facts become more easily discernible. The recent election was a definite index that that has taken place to a greater extent than was generally realized. I interpret it as a return to common sense—an acknowledgment of the fact that we can not spend ourselves into prosperity and that we can not get something for nothing.

"I believe that the generally better feeling that has been developing within the last three or four months, is a recognition of the fact that this was about to happen, and now that it has happened, if it is followed up by a more constructive approach to our economic problems as they are affected by governmental policy, which will be helpful to business as compared with the action of the past which has definitely retarded business, there will be then in the making a foundation of renewed confidence in the long pull position. And that is essential to a continued prosperity. If that develops, it seems to me that we may find it reflected in increased activity in the capital goods industries, which always reflect confidence in the long pull position.

"For the first time in many years, I am quite optimistic as to this long pull position."

The president of a prominent
(Top of next column)

FEDERAL TRADE COMMISSION

VS. GENERAL MOTORS. Testimony being given by respondents in hearings still under way in New York. Complaint involves the alleged practice of requiring dealers to handle respondent's parts only.

SIX PER CENT CASE. Ford and General Motors cited by FTC in July, 1937 for false and misleading representations in advertising finance plans. Briefs on both sides in the Ford case have been filed and final arguments may be held sometime during December. In the GM case, the examiner's report has been filed and the FTC brief was due Friday.

FOB PRICES case vs. GM and Ford. GM brief filed. Hearings on the Ford case started Nov. 29. Case involves FTC allegation that price advertising is misleading because of failure to include standard equipment in the advertised price.

FAIR TRADE PRACTICE rules for retail automobile dealers, introduced at public hearings during last NADA meeting in December (see A.I., April 30, 1938), are still under study by the FTC fair trade practice division headed by George McCorkle.

automobile factory replied—

"Perhaps it is too soon to make any worth while prediction, but I am quite confident that they were a constructive factor with respect to our own business and business as a whole."

J. I. Miller, general manager of the Cummins Engine Co., stated—

"Although we are now engaged in a program of expansion, our decision was not governed by the recent congressional election. Perhaps, however, the election may influence our market, and if that happens, we shall naturally receive a secondary influence."

The president of a leading motor vehicle factory said—

"Both in respect to our own business and business as a whole, it is my opinion that the recent congressional elections will prove to be a most constructive influence. I say this not because of any partisanship but because the defeat of the radicals who favored sitdown strikes and similar activities is sure to promote a return of confidence in the business world. It is my hope that business generally will prove worthy of the vote of confidence which it has received by assisting in a solution of the many problems which face us."

F. R. Fageol, president of the Twin Coach Co., replied—

"We here all feel it will be very beneficial. The management of this company, like that of most other companies, are anything but what you would call New Dealers, but on the other hand we do recog-

nize that the New Deal has advanced and put into effect certain constructive ideas and policies, which we believe will have a good long-range effect. We refer particularly to those new policies adopted which have to do with correcting certain evils that after a certain time seem to crop up in all human efforts.

"The results of the election undoubtedly show that the masses are again beginning to think in constructive terms. Therefore, we have a feeling that future adverse criticism of business which may be promulgated and spread by the administration will have materially less depressing effects on general business in the future than in the past, because business will have gained confidence that as a result of the elections the new Congress will be hesitant about adopting further business-depressing policies and laws. Therefore, barring some radically unforeseen new national or world condition, we feel that the entire country is headed toward a steady and healthful increase in business and employment."

Charles O. Guernsey, vice-president of the J. G. Brill Co., said—

"We find a general feeling that the recent elections indicate a definite swing toward the conservative side, with a consequent increase in confidence. We think this is a rather general condition.

"With reference to our specific business, any return of confidence helps in two ways—first, that business as a whole increases, therefore riding on transit vehicles increases, improving the earnings of our potential customers—and second, because of the increase in confidence of the operators themselves, they will be willing to make commitments for improvements, including new equipment, which are often deferred in times of uncertainty."

"This can all be summed up by saying that the recent elections will, we believe, have a very helpful and stimulating effect."

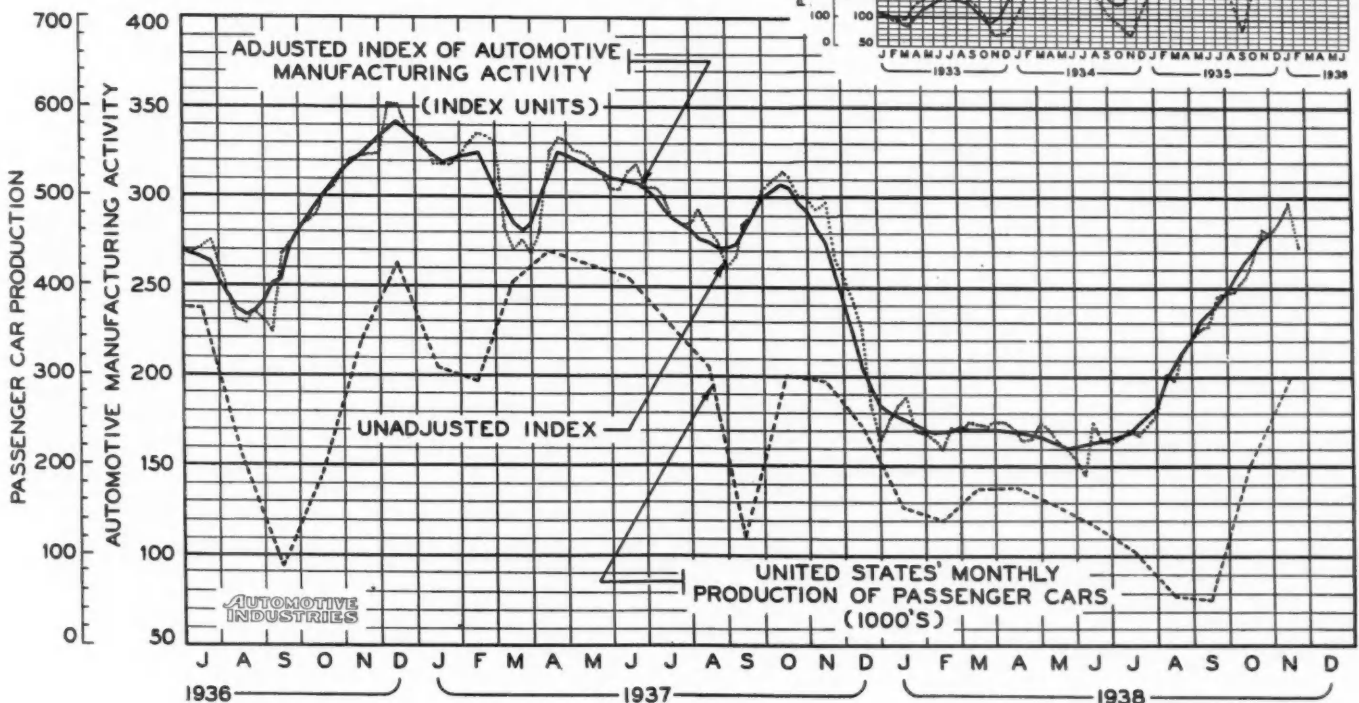
Georges Bouton

Pioneer of French Auto Industry
Dies in Paris at 91

Georges Bouton, one of the pioneers of the French automobile industry, died in Paris early in November at the ripe old age of 91. He was born in the French capital and learned the machinist's or locksmith's trade, and after having worked at his trade in several provincial cities, returned to Paris, where he formed a partnership with his brother-in-law, Trépardoux, to build model steam engines. These small engines attracted the attention of the Count De Dion, a member of a wealthy family, who conceived the idea of applying them to road vehicles. The name of the firm was changed from Trépardoux & Cie. to De Dion, Bouton & Trépardoux. During the next 12 years a suitable steam boiler was developed

(Turn to page 721, please)

Automotive Activity Index Drops To 272 Due to Holiday Plant Closings



The rate of manufacturing activity in automotive plants for the week ending Nov. 26 fell 25 points to the unadjusted index figure of 272, as indicated on the chart above. The figure for the preceding week indicated a gain of 10 points over the week ending Nov. 12.

From the fact that car and truck producers continue to boost the daily output rate and give no

indication of immediate slackening of production, it would seem that the downward move of the index is due to plant closings for the Thanksgiving holiday. As production this week will be well above last week, the index may be expected to turn upward on the chart next week.

The adjusted index continued upward to reach a point of 281, three points above last week.

News of the Industry

BOOKS OF INTEREST

THE MOTOR VEHICLE—A Descriptive Text-Book of Chassis Construction for Students, Draughtsmen and the Owner-Driver. Second Edition. By K. Newton and W. Steeds. Published by Hiffe & Sons, Ltd., London.

Quite a large number of books have been written with the object of conveying an understanding of the principles of automotive mechanism to the layman, to students, etc., and of all those which have come to the writer's attention, the one here reviewed is one of the best. As mechanical drawings are used to a large extent and the average owner-driver presumably is unfamiliar with such drawings, the first chapter is devoted to an explanation of their principles. A second chapter deals with such mechanical elements as anti-friction bearings and gears of various types which are widely used in automotive construction, while a third chapter takes up fundamental principles of mechanics. These three chapters properly prepare the lay reader for the remainder of the book, which in numerous chapters deals with the principles of the internal combustion engine and its various parts and accessories, and with the elements of the chassis. Numerous clear illustrations accompany the text. Examples, of course, are taken primarily from British practice, but American products also are well represented. The authors' style is clear and concise.

ABOUT PETROLEUM, by J. G. Crowther. Published by Oxford University Press. New York, N. Y.

This is a book intended for those users of petroleum products who are curious as to where the petroleum comes from, how it is obtained, what it is, and by what processes it is transformed into gasoline and the other derivatives that run out of pumps at filling stations or are sold at stores. It is also intended as an introductory to a large four-volume work on the Science of Petroleum by the same publishers.

The book deals with the origin of petroleum, petroleum in history, oil output and resources, the simplest hydrocarbons, crude oil, oil in the earth's crust, finding oil, hunting by physics, drilling, unit control, pipe lines, petroleum and colloids, distillation, cracking, hydrogenation, purification, refining with liquids, lubrication, knock, natural gasoline, and helium. It is a very readable volume and can be recommended to those who want a general knowledge of the methods by which motor fuels and lubricants are produced.

E. L. VALANCE

● Edward L. Valance, assistant general manager of the Houde Engineering Corp., died Nov. 24 in Buffalo, N. Y., following an operation. He was 56 years old, and a native of Buffalo.

Mr. Valance was widely known in the automotive industry, his association with it dating back to 1912 when he was manager of the Simcott Automobile Co. in Buffalo, distributors of the Simplex, Kissel and Westcott automobiles. He joined the Houde organization in 1923.

GOVERNMENT PURCHASES

● Government purchases of transportation equipment, as reported by the Public Contracts Board for the week ended Nov. 19, totaled \$173,736. The awards were:

For trucks—Coleman Motors Corp., Littleton, Colo., \$12,036; General Motors Corp. (Chev. Div.), Detroit, Mich., Leeds, Mo., Baltimore, Md., Melrose, Calif., Janesville, Wis., Norwood, Ohio, Roseland, Ga., \$108,079; Yellow Truck & Coach Mfg.

Co. (General Motors Truck & Coach Div.), Pontiac, Mich., \$10,615;

For chassis—General Motors Truck & Coach Div., Pontiac, Mich., and International Harvester Co., Inc., Washington, D. C., and Ft. Wayne, Ind., \$10,390;

For tractors—Caterpillar Tractor Co., Peoria, Ill., an estimated \$10,126; for tractor trucks and dump trailers—Mack International Motor Truck Corp., Philadelphia, Mack Mfg. Co., Allentown, Pa., and Insley Mfg. Corp., Indianapolis, Ind., an estimated \$21,875;

For motor assembly—Bendix Aviation Corp., Eclipse Aviation Div., Bendix, N. J., \$10,740.

Miscellaneous awards announced during the same period: For ammeters—Western Electrical Instrument Corp., Newark, N. J., \$12,328; for spark plugs—The BG Corp., New York City, \$84,872; for diesel engine parts—Nordberg Mfg. Co., Milwaukee, Wis., \$14,536; for tires and tubes—F. G. Schenuit Rubber Co., Baltimore, Md., an indefinite amount, purchases to be made if, when and where needed.

VENTILATION CODE

● A subcommittee of the Exhaust-Code Committee of the American Standards Association is planning a code for ventilation in electroplating establishments which would protect workers against injurious vapors and liquids. The code will cover chromium-, cadmium-, and lead-plating, plating from cyanide solutions, and anodizing. The plan is to divide the principal operations into groups according to hazards and define the type and degree of ventilation necessary for each group, rather than to attempt to specify exact degrees of ventilation for each process or operation. A questionnaire is now being sent to electroplating companies to find out how they are solving these problems now and what results they are obtaining in eliminating the hazards.

SEA SPORT AWARD

● Gudio Cattaneo, Italian motor boat racer and designer of record breaking craft, has been awarded the 1938 Medal for Sport of the International Motor Yachting Union. The prize, presented annually for outstanding achievement in world motor boating, went to Sir Malcolm Campbell in 1937.

England Promotes Producer Gas

A committee representing the Mining Association, the Coal-Research Council, and the British Coal Utilization Research Association has been formed to make a comprehensive survey of the economic and operating problems involved in the use of producer gas in the operation of commercial transport road vehicles. During the past several years a number of such vehicles have been operated experimentally in the United Kingdom, and several new designs are to be shown at the coming Scottish automobile show. The Council holds that the development of producer gas plants suitable for installation in motor vehicles has been held back in Great Britain by existing legislation, and one of its objects seems to be to champion legislation which will serve to encourage the production of vehicles operating on native fuel.

It is pointed out in this connection that in France all producer-gas transport vehicles are tax-exempt, and public transportation companies are required to operate at least 10 percent of their vehicles on producer gas. In Germany a tax rebate is granted on all vehicles operating on producer gas or compressed gas, while in Italy all public transport vehicles will have to operate on producer gas or other native fuels after the end of the current year.

The French decree making it compulsory for public transportation companies to operate 10 per cent of their vehicles on producer gas, which went into effect a little more than a year ago, has just been extended to Algiers. In fleets of 10 to 15 vehicles one must be operated on gas; in fleets of 16 to 25, two; in fleets of 26 to 35, three, and so on.



Written by the Guaranty Trust Co., New York

Maintenance of general business activity at or above the recently attained levels was reported last week. As measured by the index of the *Journal of Commerce*, the gain in the preceding week was substantial; for that period, ended Nov. 19, the index stood at 92.2, as against a revised figure of 90.2 for the week before and 85.2 a year earlier.

Wholesale trade was moderately

enlivened last week, with most purchases for current requirements; no general tendency to cover distant demand has yet appeared. Retail trade, although still lagging in the recovery movement, advanced at a quickened pace, with sales of seasonal goods in gratifying volume.

Production of electricity by the light and power industry in the week ended Nov. 19 again increased the margin of current output above last year's corresponding figures, with

an excess of 2.1 per cent, as against 1.5 per cent in the preceding week and 0.2 per cent a fortnight earlier.

Railway freight loadings in the same week increased, contrary to the usual seasonal trend, as they did three weeks earlier. The reported loadings, 657,477 cars, were 20,767 cars more than in the preceding week and for the first time this year exceeded the corresponding week last year—by 1.9 per cent.

The estimated average daily output of bituminous coal in the same period was 1,445,000 tons, registering an increase of 15,000 tons over the average for the week before.

Lumber production, shipments, and new orders in the week ended Nov. 19 were all greater than in the preceding holiday week. New orders, the heaviest in four weeks, were 50 per cent above the corresponding 1937 figure.

Production of Portland cement totaled 11,556,000 barrels in October, and mills shipped 12,357,000 barrels. As compared with October, 1937, data, production was up 1.6 per cent and shipments increased 10.4 per cent. Cement in stock at mills at the end of the month, 20,574,000 barrels, was 4.6 per cent less than the corresponding amount last year.

Professor Fisher's index of wholesale commodity prices for the week ended Nov. 26 stood at 80.5, as compared with 80.4 for the preceding week. The variation in this index has not exceeded one fractional point in the last four weeks.

Member bank reserve balances increased \$91,712,000 in the week ended Nov. 23, total bills discounted increased \$56,000, and industrial advances declined by \$218,000. Estimated excess reserves of the member banks increased \$90,000,000 to \$3,350,000,000.

Wage-Hour Act

(Continued from page 714)

of providing some specific penalty and expressed his intention to consider asking Congress to pass such a clarification.

In the meantime, it was indicated, the Administrator, in attempting to bring violators of this provision into line, would undertake to determine by examination of company records whether wage cuts were a necessity because of curtailed business or whether a move to avoid compliance with the law.

Absence of provisions in the act for fair trade practice provisions, which would round out the Wage-Hour law to make it comparable



G. E. JOHNSON
... of Auto Spring & Bearing Co., president
MEWA.



F. G. WACKER
... of Automotive Maintenance Machinery Co., president
MEMA.



V. C. HOSSELLMAN
... of Siferd-Hosellman Co., president
NSPA.



J. M. SPANGLER
... of National Carbon Co., joint operating committee chairman.

A.S.I. Show Opening

For the ninth consecutive year three automotive groups — National Standard Parts Association, Motor and Equipment Manufacturers Association, Motor and Equipment Wholesalers Association—functioning through a joint operating committee, present the Automotive Service Industries Show. The show, opening on Dec. 5 and running through Dec. 10, is again this year being held at the Navy Pier, Chicago.

Show-time also finds the three associations meeting separately for their annual conventions. Preceding the show by three days, the NSPA opened its convention on Friday with a general session attended by manufacturers and wholesalers. The MEWA convention was scheduled to start Dec. 3. The MEMA convenes Dec. 6.

Highlights of the show and convention will be presented in AUTOMOTIVE INDUSTRIES news pages next week.

with the defunct NRA, may be supplied by a scheme under consideration by Thurman Arnold, head of the Justice Department's anti-trust division. Arnold, starting from the recent consent decrees signed by the Ford Motor Co. and the Chrysler Motor Corp., under which these companies agreed to rules of conduct in advertising plans for financing automobile sales, would build up a number of consent decrees to be used as a guide.

Business groups have complained for years that the anti-trust laws as administered do not enlighten them as to what they can do without running afoul of the laws. Under Arnold's plan, rules formulated under a series of consent decrees would supply that missing link, thereby furnishing precedents for business

to follow. Within limits, the terms of consent decrees are written by firms against which the Justice Department has initiated prosecution and, according to the Department's announced procedure, "must offer in addition to a prohibition of the violations of the anti-trust laws with the prospective defendants are charged, substantial public benefits connected with the policy of maintaining free competition in an orderly market which could not be obtained by criminal prosecution."

Of course, under the NRA, the anti-trust laws were temporarily abrogated while under Mr. Arnold's plan they would be vigorously enforced with guide lines set up as a concomitant standard based upon the Justice Department's civil procedure—consent decrees.

News of the Industry

WHAT ARE THEY DOING?

H. W. PETERS, former vice president of the Packard Motor Co., and assistant general sales manager of the Cadillac Motor Car Co., has been appointed provost of Cornell University.

Succeeding the late **CHARLES W. PAESCHKE**, **FRANK A. FREY** has been elected president and treasurer of the Geuder, Paeschke & Frey Co. **HENRY F. MILLMANN** has been elected executive vice-president and general manager. **A. G. PAESCHKE** has been re-elected secretary of the company.

W. A. TIPTON, of United States Rubber Products, Inc., has been appointed a director of the rubber division of the Mechanical Packing Association.

The following men have been elected directors of the Motor and Equipment Manufacturers Association for the 1939-41 term: **C. P. BREWSTER**, K-D Manufacturing Co., **R. L. SOMMERVILLE**, The Electric Storage Battery Co., **J. C. STILES**, Stiles - Barrett Corp., and **E. W. WINDSOR**, The Sherwin-Williams Co.

Election of **J. CARLTON WARD, Jr.**, as vice-president and director of United Aircraft Corp., and his appointment as general manager of the Pratt & Whitney Aircraft division, has been announced. Mr. Ward succeeds **C. W. DEEDS**, who resigned to become president of the Chandler Evans Corp. It was also announced that **H. M. HORNER** has been appointed assistant general manager of Pratt & Whitney Aircraft.

W. O. BATES, Jr., recently announced in AUTOMOTIVE INDUSTRIES as becoming head of the patent department of the Caterpillar Tractor Co., has more recently been appointed a vice-president of the company.

The Civil Aeronautics Authority's Air Safety Board has announced these appointments: **W. S. McDUFFEE**, of Fort Worth, Texas, executive officer; **LOUIS R. INWOOD**, of Los Angeles, assistant executive officer; **DARRELL T. LANE**, of Salt Lake City, legal adviser; **ROBERT D. HOYT**, of Clearwater, Fla., chief of the investigation section; **FRED M. GLASS**, formerly of St. Louis, Mo., chief of the examiner's section; **JESSE LANKFORD**, of Martinsville, Ind., chief of the analysis section; **ROLAND ROHLFS**, of Buffalo, N. Y., chief of the technical section; **FRANK MILLER**, of Glendale and Los Angeles, Calif., chief of the recommendation division; and **W. S. STAPLER**, of Macon, Ga., chief of the liaison division.

Creation of a new post in the wholesale organization has been announced by Chevrolet. The new position is that of assistant regional manager in charge of new car operations. The following men from the Chevrolet organization have been appointed to this position in the nine regional zones: **F. E. ZORNIGER**, **J. E. SIMMONS**, **H. J. BOSTWICK**, **R. C. MEDDAUGH**, **C. L. MILLIKEN**, **D. F. ADDERHOLD**, **W. V. SHELL**, **E. S. GRAHAM**, and **G. E. HOLM**.

JOSEPH GESCHELIN, Detroit Technical Editor, Chilton Publications, will address Indiana Section, Society of Automotive Engineers, on Dec. 8 at Indianapolis. His discussion will center about the high spots of engineering design in 1939 motor cars with some reference to new production processes.

Valentine & Co., Inc., announce the appointment of **T. E. BARNER** as manager of their automotive refinishing department covering the Central West. Mr. Barner will have his headquarters in Chicago.

H. L. RAMSAY has been appointed sales promotion manager for Porter-Cable Machine Co. of Syracuse, N. Y.

PUBLICATIONS AVAILABLE

Bulletin No. 945 of the Buda Co. describes the Buda Chore Boy—a three wheel shop truck.*

George Scherr Co., Inc., has issued a folder illustrating and describing the "Compar" combined indicating micrometer and comparator.*

New Departure announces publication of the 1939 edition of its **Ball Bearing Interchangeability Tables** in booklet form (R20)*

The Lincoln Electric Co. has published a 20-page booklet giving the story of the arc welding technique made available by the Lincoln "Shield-Arc" Welder.*

Some of the factors affecting the protective value of paints for steel and galvanized surfaces are discussed in Building Materials and Structures Report No. 8, just released by the National Bureau of Standards. Copies of the report, BMS8, are obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 10 cents a copy.

* Obtainable from editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia.

GROWING CUB

● Application for listing of the shares of Cub Aircraft Corp., Ltd., of Hamilton, Ont., on the Montreal Curb Market has been approved, and the shares will be called for trading in due course. The company has an authorized capital of 7500 shares of 6 per cent preferred stock (\$25 par) and 80,000 shares no-par value common stock, of which 443 preferred and 65,796 common shares are outstanding.

Automotive Metal Markets

Reports of Forward Buying of Finished Sheet Steel Not Borne Out by Developments

Specifications from automotive consumers have relieved flat steel rollers of all worry regarding operating rates over the remainder of the year. Representative opinion in the steel market clings to the conviction that the subject of price will not be permitted to impair the free flow of buying. There is some talk that quantity discounts may be eliminated, which in effect would mean an advance of \$3 per ton, virtually all worth while business from automobile manufacturers and parts makers consisting of tonnages subject to the discount applicable when 150 tons or more of one grade, gage and size are released for shipment to one destination at one time. Competition in the sheet and strip steel field is no less keen, although somewhat more orderly than it was when prices broke sharply in October. Since then the leading interest's subsidiaries have recovered

Boeing-TWA in Contract Suit

Boeing Aircraft Co., Seattle, has filed in King County superior court a suit against Transcontinental & Western Air, Inc., alleging breach of contract to buy six four-engined transport planes. The complaint alleges TWA at various times, during June and July of 1938, represented to Boeing that it would be unable to perform its obligations under contract, and that Boeing thereafter endeavored to arrive at a modified agreement which would be within TWA's claimed ability to perform. When this was unsuccessful, Boeing declared an anticipatory breach of contract and notified TWA that Boeing would look to TWA for all damages arising from such breach, it was stated.

Reply of TWA to the suit was to secure transfer of the case from the Seattle superior court to the United States district court. Federal court requirements that at least \$3,000 be represented in federal court action was satisfied by TWA's claim that \$397,000 had already been paid to Boeing under the plane contract. This sum should be returned to Transcontinental & Western Air, Inc., the reply states.

TWA's reply also says that Boeing owes about \$9,000 to TWA for failure to secure a Government approved-type certificate on the first four-engine plane completed under the contract. Boeing's original com-

(Turn to page 748, please)

very nearly their normal share of business. While it is true that the large automobile manufacturers are anticipating their requirements of finished sheets more so than they did a few months ago, reports of much forward buying are hardly borne out by developments. What automotive buyers are anxious to avoid, are delays in the receipt of steel shipments, which might hold up assemblies, but the possibility of price advances hardly enters into the placing of fresh commitments. This week's rate of employed ingot capacity is reported by the American Iron and Steel Institute at 60.7 per cent, a decline of 1.9 per cent from last week, but with quite a few buyers bent on holding down end-of-the-year inventories, this slight dip does not necessarily indicate a downtrend in the rate at which steel is being consumed.

Electrolytic copper was offered in

the open market at the beginning of the week at 10¼c., \$20 a ton below the quotation of mine producers and custom smelters. Reimposition of restrictions on production abroad will not become effective until Jan. 1, 1939. Weakness in sterling exchange intensified the weakness of the red metal, and the situation in France, one of the best customers of American copper producers, aggravated this situation. Refiners again reduced their scrap intake price, lowering it to 8¾c. for No. 1 wire.

—W. C. H.

Georges Bouton Dies
(Continued from page 717)

and a considerable number of coke-burning steam vehicles were built, no two of them alike. However, it proved very difficult to find purchasers for these vehicles. The first French automobile race in France, between Paris and Rouen in 1894, was won by a De Dion steam wagon. However, in the race between Paris and Bordeaux, held the following year, all of the 10 vehicles to finish were propelled by gasoline engines, and this convinced the Count De Dion that the future belonged to the internal-combustion engine.

The firm therefore turned its attention to gasoline engines, and in 1895 produced one of the first really high-speed engines, a single-cylinder, vertical, air-cooled design of 2-in. bore by 2¾-in. stroke, which originally developed ½ hp. This engine was fitted to a tricycle. Engines of similar design were gradually improved until as much as 1¾ hp. was obtained, and the tricycles fitted with them found a ready sale.

Many firms that later became famous in the automobile industries of different countries started out by building vehicles equipped with De



GEORGES BOUTON

Dion engines. In this country the Pierce-Arrow Motor Car Co. and the Peerless Motor Car Co. both started out by building motorettes, that is, light quadricycles or tricycles equipped with an imported De Dion engine. An agency for De Dion-Bouton motorcycles and motorettes was established in Boston and a De Dion-Bouton Motorette Co. began production in Brooklyn, N. Y., but it had only a short life.

The firm of De Dion, Bouton & Cie. occupied a prominent place in the French automobile industry up to the time of the war, being one of the largest producers in France. After the war its fortunes declined, and it had to go through a reorganization, but the Société Nouvelle des Automobiles De Dion-Bouton is still doing business at the original location of the predecessor company on the Quai National in Puteaux, a Paris suburb.

Passenger Car Production by Wholesale Price Classes
(U. S. and Canada)

	Ten Months 1938 and 1937 Compared		Per Cent Change	Per Cent of Total	
	1938	1937		1938	1937
Under \$750	1,266,870	3,310,305	-61.8	87.45	94.56
\$751-\$1000	159,703	152,588	+ 4.8	11.02	4.36
\$1001-\$1500	17,780	25,604	-30.6	1.23	.73
\$1501-\$2000	2,662	9,161	-71.0	.18	.26
\$2001-\$3000	1,454	2,760	-47.3	.10	.08
\$3001 and over	306	212	+44.2	.02	.01
Total	1,448,775	3,500,630	-58.6	100.00	100.00

Truck Production by Capacities
(U. S. and Canada)

	Ten Months 1938 and 1937 Compared		Per Cent Change	Per Cent of Total	
	1938	1937		1938	1937
1½ Tons and less	378,376	737,415	-48.7	92.39	93.13
2 to 3 Tons	16,007	32,615	-50.9	3.91	4.12
3½ Tons and over	7,791	11,537	-32.5	1.90	1.46
Special and buses	7,382	10,262	-28.0	1.80	1.29
Total	409,556	791,829	-48.2	100.00	100.00

Labor

UAW Leaders Attempt to Keep Peace on Labor Front

Continued peace along the labor front in the automobile industry during the next month or so will depend largely on the ability of Homer Martin and other leaders in the United Automobile Workers Union to sit on the lid of a pot which shows intermittent signs of boiling over.

Thus far the efforts of Martin and his lieutenants have been successful in steering potential work stoppages into more peaceful channels, principally the negotiation route. Several examples have occurred during the latter part of November.

Most serious recent outburst was a brief sit-down strike in the No. 1 plant of the Chevrolet Gear and Axle division on Nov. 25 which prevented work, as planned to make up for the Thanksgiving holiday, on Saturday, Nov. 26.

A wildcat strike of 60 employes in the body handling department of the Plymouth division of Chrysler Corp. caused the closing of the entire Plymouth plant and the Briggs Mfg. Co. plant, manufacturing Plymouth bodies, shortly after work started on Wednesday, Nov. 30. Close to 14,000 employes were affected including 6000 on the Plymouth day shift, 6900 at Briggs and 1700 in the Dodge plant engaged in production of Plymouth coupes.

The strike was settled at a meeting of the executive board of Local 51 at three o'clock the same day. The Local's president, Leo Lamotte, who was at the plant when members of his union called the strike, was instructed to order the men back to work. A spokesman at UAW headquarters said that it was a "wildcat strike and there was no justification for it."

Largely through the intervention of UAW leaders members of the Hudson local had remained at work pending negotiation of a new contract which was approved by a majority vote of the local on Nov. 27. The new agreement replaces a former one which had expired on April 8. Earlier in the week a strike at the Packard Motor Car Co., voted by the Packard local to take effect on Nov. 23, was averted when Martin issued an appeal to the local to continue at work and promised the support of the international union to adjust grievances through negotiations. The point at issue was a demand for reclassification of the wages of some 100 employes.

News of the Industry

Foreign Trade

(Continued from page 715)

AIRCRAFT ACTIVITY

• Ryan Aeronautical Co. will shortly invest approximately \$18,000 in additions to plants and facilities, and for machinery and tools, according to present plans. Another \$12,700 will be used for working capital, and the purchase of raw material, accessories and finished parts. Approximately \$10,000 will be allocated to engineering expenses and development of new models. Funds for these expenditures will be provided through sale of 20,350 shares of capital stock of Ryan Aeronautical Co. at \$2 a share. G. Brashears & Company, Los Angeles investment firm, has exercised an option to purchase the stock which will increase the company's outstanding capitalization from 269,650 shares to 290,000 shares.

• Deliveries of airplanes and parts by Consolidated Aircraft Corp., for 1938 are expected to total in the neighborhood of \$12,000,000, or about the same as reported for 1937. For the ten months ended October 31, deliveries totaled \$10,300,000.

About 70 per cent of Consolidated's deliveries to date this year have been patrol bombers for the United States Navy, with the remainder composed of spare parts.

American Export Airlines has ordered a PBY model seaplane from the company which will be used to survey a proposed transatlantic passenger and express route. Consolidated also recently delivered its XPB2Y-L experimental four-motored patrol bomber to the Navy. Last month this seaplane flew non-stop from San Diego to Washington, D. C., in little over 13 hours.

The new ship is about twice the size of the patrol bomber being completed this year and weighs about 50,000 pounds, as against 25,000 pounds for the patrol bombers. Original speed of 230 miles an hour was claimed for the ship with 1000 hp. engines, but experiments have been made to place higher horsepower units when and if production models are turned out. Flying range has been estimated at 4500 miles, or double that of the patrol bombers.

• Public offering is being made this week of 17,560 shares of capital stock of Aircraft Precision Products, Inc., priced at \$10 a share. The company was organized by interests affiliated with aircraft manufacturing companies in Southern California and is engaged in the manufacture and machining of metal parts and precision units used in constructing and equipping airplanes. Included in its operations is the manufacture of parts used in hydraulic assemblies which require unusual workmanship, and tools and machinery of precision.

Principal customers include Douglas Aircraft, Lockheed Aircraft, and the Vultee division of Aviation Manufacturing Corp., as well as substantial export customers, it is said. An important part of the units produced were made for use in aircraft ordered under United States Government contract.

Officers and directors of the company include men affiliated in executive capacities with leading aircraft companies. Among these are Charles T. Leigh, vice president and director of Consolidated Aircraft Corp.; R. J. Wig, director of Douglas Aircraft Corp.; F. W. Conant, assistant general manager of Douglas; Robert E. Gross, chairman of the board, president and treasurer of Lockheed Aircraft Corp.; Richard W. Miller vice president of Aviation Manufacturing Corp. and manager of its Vultee division.

• James Work, president of the Brewster Aeronautical Corp., has announced that the company is now moving into its new building to provide for expansion of its operations in 1939. The new plant, in

which planes and parts will be manufactured, is in Long Island City and was formerly owned by the Pierce-Arrow Motor Car Co.

HITCHED TO A STAR

• Operations of the Lackawanna plant of the Bethlehem Steel Co. are mounting rapidly, due to increased orders from the automobile industry, according to plant officials.

Active purchases of strip steel have been resumed and the big strip mill here is operating around four or five days a week, the best level since early this spring.

• Now experiencing an almost spectacular upsurge in auto carrying, Nicholson Universal Steamship Co., which is bringing 4000 cars a week to Buffalo, and the Detroit & Cleveland Navigation Co. will run their boats possibly until Dec. 10 or 12, depending on weather conditions.

• Twelve million dollars worth of new automobiles, just off Detroit assembly lines, have been floated down Lake Erie and unloaded in Buffalo during the past two weeks in the year's biggest rush to get new cars in the hands of dealers in the 500-mile area of the East.

The Chrysler Corp. alone has shipped about 9000 cars into Buffalo in the last two weeks.

Four lake shipping lines, operating more than 20 boats in the automobile carrying trade, are unloading cars in Buffalo at the rate of about 8000 a week. Forty-nine trucking concerns have pressed into service nearly all of the 1500 truck-away outfits, in the rush to get cars from here to destinations before the oncoming winter weather, with its highway hazards, hampers delivery.

MARINE SHOW

• Success of the 1939 National Motor Boat Show, to be held at Grand Central Palace, New York, Jan. 6 to 14, already is assured, Charles A. Criqui, chairman of the show committee of the National Association of Engine and Boat Manufacturers, announced.

Space has been allotted for 151 exhibits, compared with a total of 158 at last year's show, Criqui said, and present indications point to an increased number of displays in every department of the 1939 exposition. The marine engine division already is over the top with six new exhibitors.

CONVENTIONS AND MEETINGS

National Industrial Council Meeting,
New YorkDec. 5-6
Congress of American Industry, New
YorkDec. 7-9
SAE Annual Meeting, Detroit....Jan. 9-13

SHOWS AT HOME AND ABROAD

New Orleans, La., Automobile Show,
Dec. 3-5
Denver, Colo., Automobile Show,
Dec. 5-10
Automotive Service Industries Show,
ChicagoDec. 5-10
Grand Rapids, Mich., Automobile
ShowJan. 2-7
National Motor Boat Show, New York,
Jan. 6-14
Seattle, Wash., Automobile Show,
Jan. 9-15
Berlin, Germany, Automobile Show,
Feb. 17-March 5

stated in an article in *Industrial Standardization*, "The importance of Argentina as an independent market, as well as an influence upon industrial engineering thought in neighboring countries, is generally understood. That manufacturers in every industrial nation will do their utmost to dominate the Argentine market may be taken for granted. What is not so self-evident is that such an effort is already well under way, and that the activities of at least one competitor nation are so well organized as to constitute a serious threat to continued American leadership.

"In meeting this situation, the first problem is to secure universal approval for the standards upon which our own industrialism has been built, so that purchase specifications and codes will not be written to favor European products at the expense of those offered by American suppliers."

Of particular interest to American aviation interests is the report that, in an effort to increase Italian influence, the Italian Air Ministry is striving to complete a high-speed air mail and express service between Rome and Buenos Aires early next year. A passenger line, fed by a network of Italian subsidized companies in Argentina, may follow, it was said.

AMA Meeting

An analysis of the trade agreement negotiated with the United Kingdom and a review of the Administration's trade agreement program and its possibilities for the future were up for discussion at a meeting of the Automobile Manufacturers' Association's Export Committee on Friday in Washington.

Also scheduled to be taken up was the subject of financing facilities in countries having exchange restrictions, and a report of the Overseas Contact Committee, headed by C. B. Thomas, general sales manager of the Chrysler Export Corporation.

B. C. Budd, chairman of the Current Problems Sub-Committee, and general manager of Packard Motors Export Corp., and Arvid L. Frank, chairman of the Trade Agreement Sub-Committee and president of the Studebaker Export Corp., also were scheduled to submit reports. George F. Bauer, chairman of AMA's Export Committee, was expected to release a statement on the United Kingdom trade agreement at the conclusion of the meeting.

TOOLS OF TOMORROW

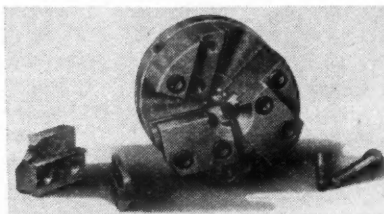
Forming Head

... Landis designs special unit for use on its automatic forming and threading machines

The Landis Machine Co., Inc., Waynesboro, Pa., recently designed a special forming head for use on its automatic forming and threading machine. Heretofore, the forming head used on this machine merely faced and bevelled or "pointed" the end of the bolt or screw. The special head has two additional functions. In addition to facing and bevelling the end of the work, the cutters are designed to reduce the body diameter of the work and face the shoulder at the end of the cut.

To reduce the strain on the head, the cutting load is distributed over three cutters. The cutters are located and lodged securely in the correct cutting position by a setting gage and a clamping action. Provision is made also for the independent

adjustment of each cutter holder. The forming head body and the cutting tool holders are made of alloy steel which has been heat treated.



Landis special forming head for use on automatic forming and threading machine.

Filter Lines

... High flexibility and heat-resistance in new type offered by Imperial Brass

A flexible fuel line which is said to offer superior flexibility and heat-resistance as well as universal adaptability to a wide variety of oil filter

installations has been announced by the Imperial Brass Mfg. Co., Chicago.

The manufacturer's claims for the new product include: 1. Ability to take 1-in. radius bend without flattening or kinking shut; 2. A coreless structure which permits an unusual amount of twisting without restriction to the flow of oil or damage to the line; 3. Oil has no effect on the neoprene composition lining and the closely woven fabric covering, which is coated with enamel, will resist gasoline from the outside; 4. Ability to withstand a temperature of 300 deg. Fahr. for 50 continuous hours. (Likewise unaffected by cold.) 5. Lines will not swell or draw closed; 6. Bursting capacity of 2000 lb., and a recommended working capacity of 500 lb.

GM Employee Benefit Plans

Complete text of the General Motors Corp. employee benefit plans, discussed on page 661 of the Nov. 19 issue of *Automotive Industries*, is as follows:

EMPLOYEE BENEFIT PLANS

General Motors Corporation has established the following benefit plans for the hourly wage employees of the Corporation and its wholly owned Subsidiaries in the United States.

I

The plans are effective for the calendar year 1939, and it is the intention of the Corporation to extend them from year to year, subject to such changes and modifications as may be required by experience and the circumstances then prevailing.

II

INCOME SECURITY PLAN

Employees with 5 years' service or more on Jan. 1, 1939, and who worked any time during Dec., 1938, will be eligible—

(a) If, in any week while this plan is operative, an eligible employee's earnings from the Corporation and/or other regular employment are less than 60 per cent of his standard weekly earnings, as herein-after defined, the Corporation will advance, at the option of the employee, the difference between his actual earnings and 60 per cent of his standard weekly earnings, less any Unemployment Compensation to which the employee may be entitled. Thus, for the entire year the eligible employee is assured that in each week his minimum weekly income will be at least 60 per cent of the standard.

(Turn to page 744, please)

Passenger Car and Truck Production (U. S. and Canada)

	October 1938	September 1938	October 1937	Ten Months	
				1938	1937
Passenger Cars—U. S. and Canada					
Domestic Market—U. S.	171,371	60,177	273,753	1,209,563	3,643,386
Foreign Market—U. S.	16,123	4,982	24,909	145,072	272,503
Canada	5,412	4,290	7,378	94,140	153,046
Total	192,906	69,449	306,040	1,448,775	4,068,935
Trucks—U. S. and Canada					
Domestic Market—U. S.	16,697	8,697	22,595	265,277	689,674
Foreign Market—U. S.	5,331	9,678	8,619	108,989	203,411
Canada	362	1,799	725	35,340	54,417
Total	22,390	20,174	31,939	409,606	947,502
Total—Domestic Market—U. S.	188,068	68,874	296,348	1,474,840	4,333,060
Total—Foreign Market—U. S.	21,454	14,660	33,528	254,061	475,914
Total—Canada	5,774	6,089	8,103	129,480	207,463
Total—Cars and Trucks—U. S. and Canada	215,296	89,623	337,979	1,858,381	5,016,437

Monthly Motor Vehicle Production—U. S. and Canada

	Passenger Cars		Trucks		Total Motor Vehicles	
	1938	1937	1938	1937	1938	1937
January	168,890	324,191	58,240	74,995	227,130	399,186
February	151,133	310,961	51,456	72,939	202,589	383,900
March	186,341	423,006	52,257	96,016	238,598	519,022
April	190,111	452,907	48,022	100,324	238,133	553,231
May	168,599	443,412	41,584	96,965	210,183	540,377
June	147,545	429,333	41,854	91,820	189,399	521,153
July	112,114	372,913	38,330	83,996	150,444	456,909
August	61,687	317,270	35,249	87,802	96,936	405,072
September	69,449	120,597	20,174	55,033	89,623	175,630
October	192,906	306,040	22,390	31,939	215,296	337,979
November		309,121		67,508		376,629
December		258,769		88,117		346,886
Total		4,068,920		947,454		5,016,374

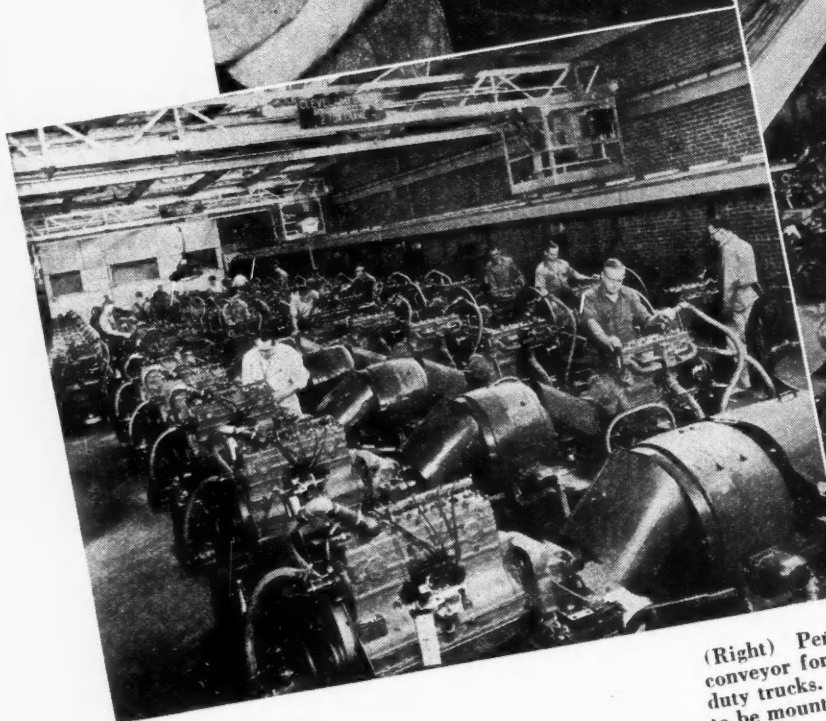
Precision is

BY JOSEPH GESCHELIN

WHEN the new International Harvester Company's truck engine works in Indianapolis started its production lines recently, we were reminded that the

(Left) Sheffield Shadow Gage for checking size, out-of-round, and taper to 0.0001 in. on 100 per cent final inspection of cylinder sleeves.

(Lower left) General view block test department with accommodations for 117 engines on test at same time. Engines are delivered to the room on a trolley conveyor and leave by the same means. Three two-ton cranes are used to remove the engines from the conveyor, set them in the stands, and return them back to the conveyor.



(Right) Perspective of continuously moving, pallet-type power conveyor for assembly of "L"-head type engines used in the light-duty trucks. Note that pallet permits the engine, at various stages, to be mounted on either side or upright and to be indexed radially.

Basic in IHC Engine Plant

decision to build the plant was made early in 1937 when the company then newly modernized its other truck plants as part of the program for meeting the increased demand for International trucks. Readers of *AUTOMOTIVE INDUSTRIES* will recall that the IHC truck plant facilities at Fort Wayne, Indiana, and Springfield, Ohio, formed the basis for the thirteenth article in the series of first-of-month production features. (*AUTOMOTIVE INDUSTRIES*, May 1, 1937.)

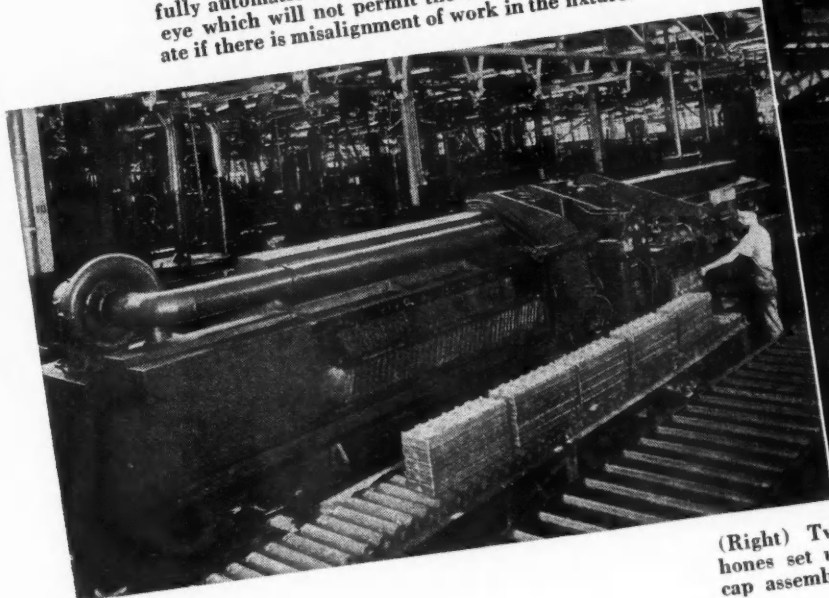
With modernity as a characteristic of the new Indianapolis plant, its greatest appeal to factory executives is found in the skill with which mass-production machinery and tech-

niques are used in the building of a varied line of both heavy-duty and light-duty engines. Although the present capacity is 680 engines per day, it is of interest to note, the ultimate plan for the plant visualizes a later expansion in buildings and equipment pointing to daily capacity of 2000 engines.

Indianapolis was chosen as the location for the engine plant because of its excellent railroad and highway transportation facilities and because it so ideally spots the production of engines for shipment to the plant at

THIS IS THE THIRTY-SECOND IN THE
SERIES OF MONTHLY PRODUCTION FEATURES

(Left) Huge single-ram horizontal Cincinnati Broach for broaching top and bottom of cylinder heads. This machine is equipped with a power-operated index fixture which enables the operator to load one station of the fixture while the machine is in operation. The machine is fully automatic and is equipped with an electric eye which will not permit the machine to operate if there is misalignment of work in the fixture.



(Right) Two Barnes Honing Machines fitted with Micromatic hones set up for honing the big end of the connecting rod and cap assembly. Note the Micromatic work-holding fixtures which takes four rods in same setting.



Fort Wayne, where the heavy-duty trucks are built, and to Springfield, where the light-duty models are produced.

Present floor space comprises 363,000 sq. ft. in the manufacturing building and 260,000 sq. ft. in the foundry unit. Both the manufacturing building and the foundry are one-story structures, the latter having an "M"-shaped roof line and the manufacturing building a saw-tooth roof. Corrugated glass is used in the side walls and continuous roof sash, affording employees unexcelled natural light.

Two thousand, 350-watt Cooper-Hewitt mercury lights were installed in the manufacturing building, alone, to enable night-shift employees to work under the same advantages of good lighting as the day shifts.

The foundry structure, in which

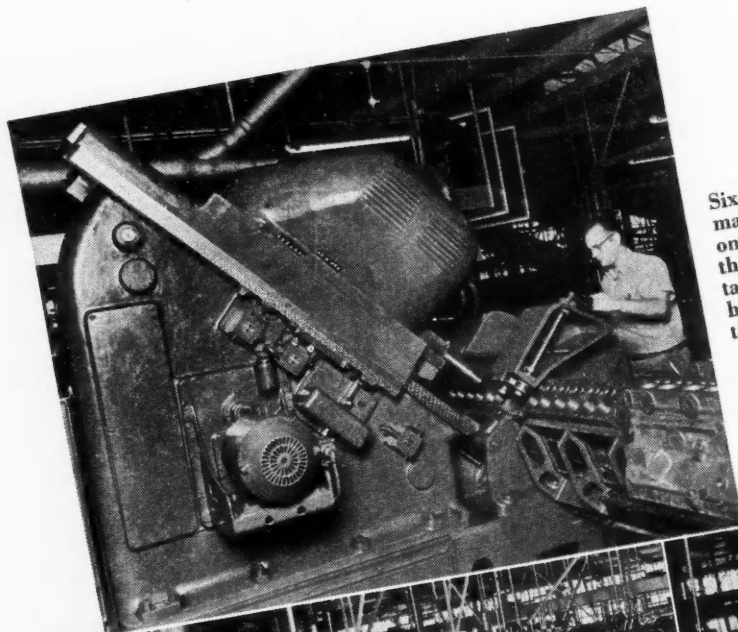
I.H.C. Executive Personnel

Chicago Central Office Staff

Fowler McCormick, Second Vice-President, in charge of Manufacturing
C. H. Smart, Assistant to Vice-President, in charge of Manufacturing
A. W. Seacord, Manager of Manufacturing
M. J. LaCroix, Works Manager, Automotive Group
K. O. Schreiber, Assistant Works Manager, Trucks

Indianapolis Truck Engine Works:

M. J. Graham, Superintendent
I. W. Davies, Assistant Superintendent
A. M. Bowers, Mechanical Engineer
W. L. Georgen, Plant Engineer
H. E. Gottberg, Production Manager
H. W. Bradley, Storekeeper
G. F. Jontz, Chief Inspector
W. L. Henry, General Foreman
C. R. Evans, Industrial Relations Manager
H. L. Elfner, Resident Product Engineer



Six-spindle W. F. and John Barnes Precision Boring machine for finish boring six cylinder bores at once. This operation requires accuracy in tenths-of-thousandths of an inch for size, out-of-round, and taper of bores, which prepares the bore for finish honing. The machine is fully automatic in operation as well as in clamping and locating the cylinder block.

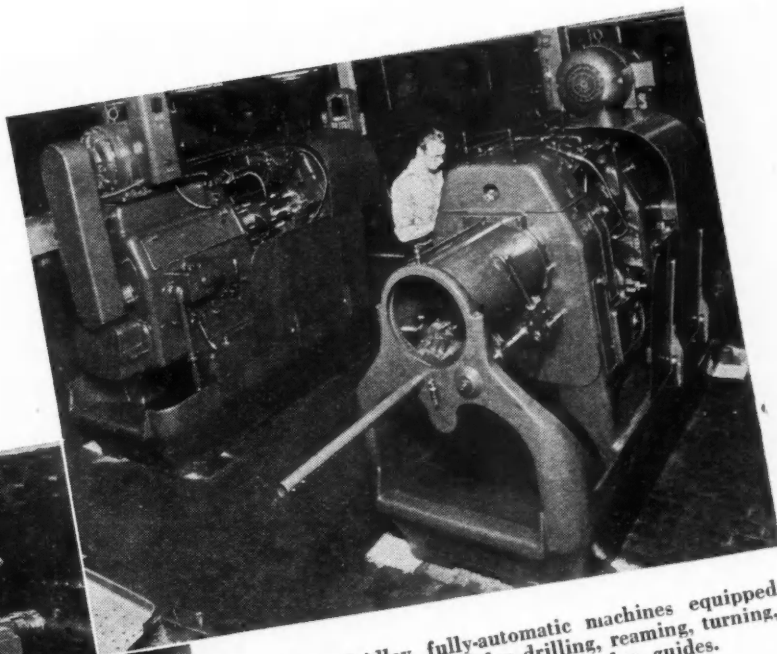
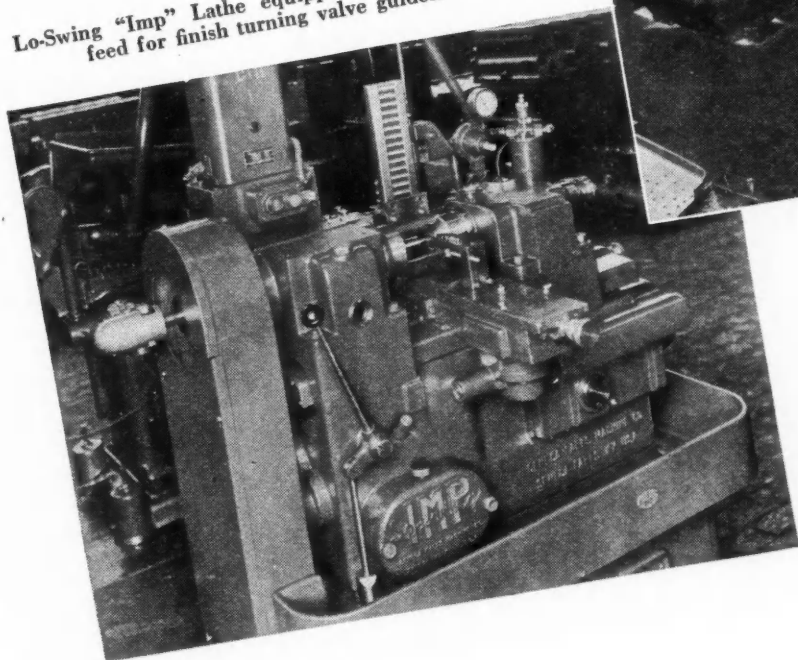
Battery of Pratt & Whitney rifle-drilling machines for drilling 3/16 in. oil hole the full length of the rod. This machine is not only automatic but frees itself of chips.



Michigan Tool Gear Finishing machine used for shaving the tooth form for metal timing gears, produces quieter and longer-life gearing.

equipment is now being installed, was built to provide for the production of 300 tons of castings per day but so planned that additions can be made to bring daily capacity up to 800 tons. As a result of an exhaustive survey by IHC engineers, the foundry will incorporate the best features of modern foundries in the automotive industry, expressing the

Lo-Swing "Imp" Lathe equipped with magazine feed for finish turning valve guides.



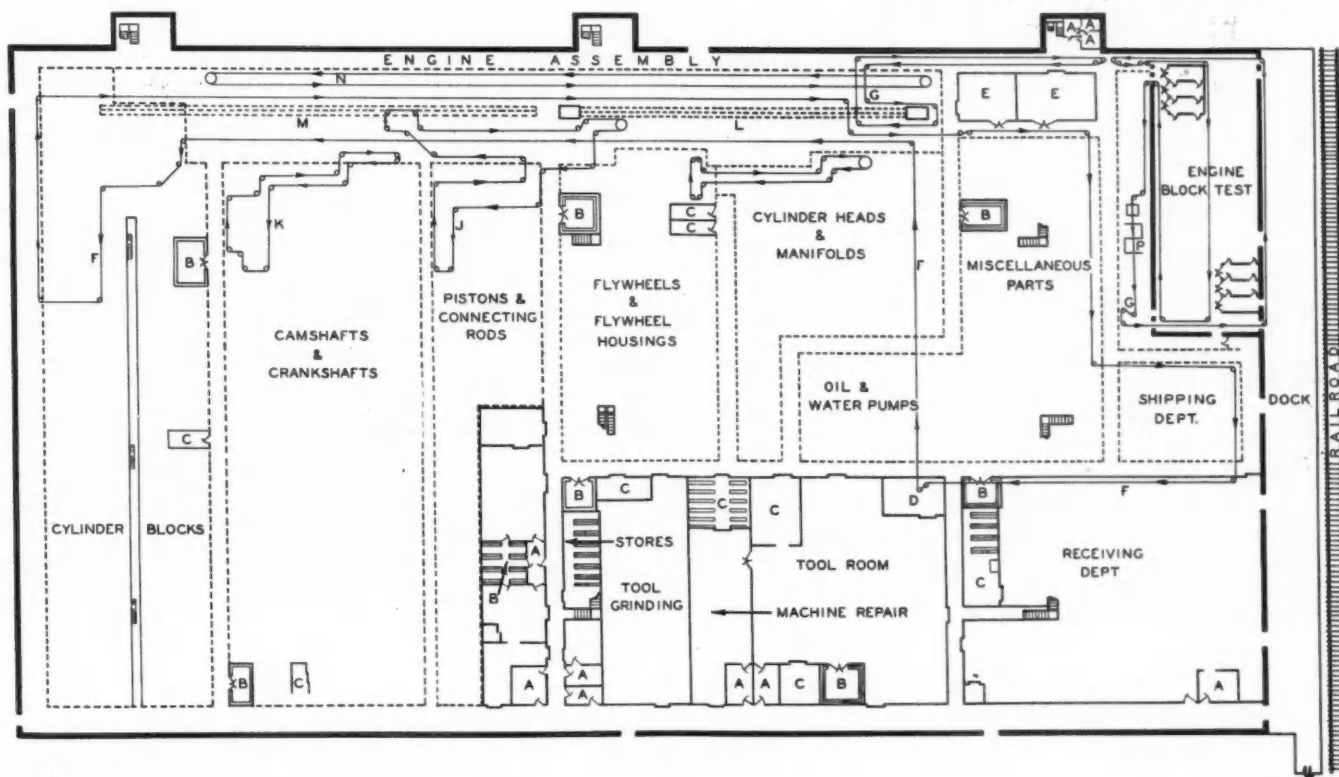
Two Gridley fully-automatic machines equipped with magazine feed for drilling, reaming, turning, facing, and chamfering valve guides.

latest developments in mechanized foundry operation.

In common with other engine plants of the industry, this one required the solution of the problem

Floor Plan—Truck Engine Works

A—Offices. B—Tool cribs. C—Miscellaneous cribs. D—Tool room—heat treat. E—Inspection. F—Conveyor. G—Motor test. H, J, K, L, M, N—Conveyors. P—Paint spray booth.



of handling a varied line of engines in a variety of sizes. For example, the Springfield plant, building light duty vehicles, takes a basic L-head engine built in six models ranging from 174 to 232 cu. in. displacement. To achieve the flexibility required for a mass-production set-up, many of the parts are interchangeable; and on the models ranging from 213 to 232 cu. in., the major elements all are interchangeable.

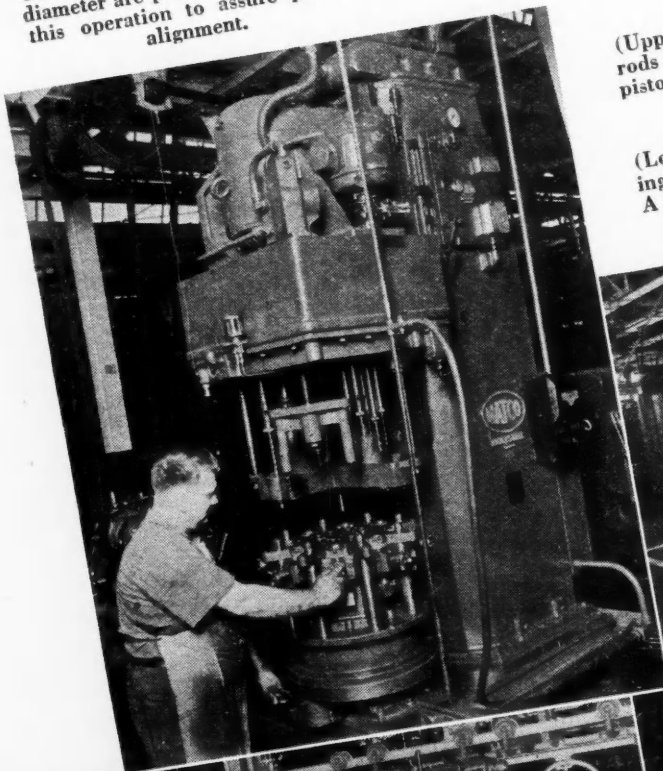
The heavy-duty line built at Fort Wayne takes three basic valve-in-head engines in six models, ranging from 241 to 450 cu. in. displacement.

Best evidence of the modernity of the plant as well as its utilization of mass-production methods is found, first, in the adoption of the relatively new process of surface broaching. Interchangeability of many major parts, resulting from close cooperation of engineering and manufacturing experience has made possible the widest use of this advanced technique. Mechanization through the adoption of the latest types of materials handling equipment of every

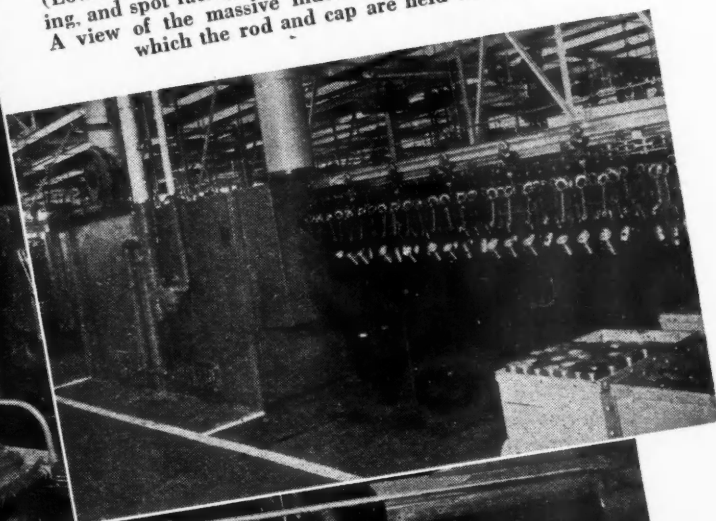
description has eliminated all of the heavy manual effort on the part of the workers, serving to expedite the smooth flow of raw materials to machine shop lines and the flow of finished parts to assembly lines according to precise schedules.

Many familiar production machines are found in the set-up—multiple spindle drills and tapping machines, Michigan Tool gear shaver, a battery of nine Blakeslee washing machines, Micromatic hones,

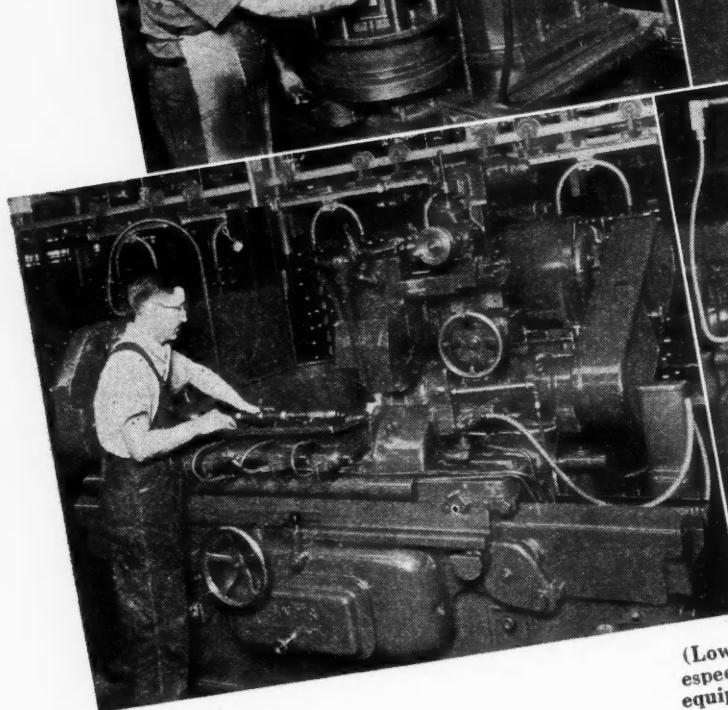
Natco machine for drilling all holes, counterboring, reaming, and tapping the oil pump body. Fixture and the head are especially built for this operation. The gear shaft hole and the gear diameter are precision bored after this operation to assure perfect alignment.



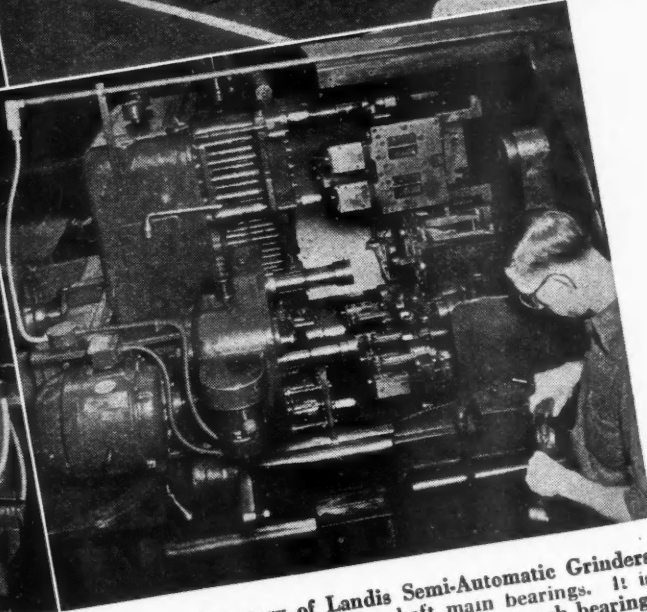
(Upper right) Blakeslee washing machine for washing connecting rods and pistons. Note the conveyors and carriers for handling pistons and rods in sets from the washing machine to inspection and assembly.



(Lower right) Greenlee machine for drilling, reaming, counterboring, and spot facing the bolt holes in both connecting rod and cap. A view of the massive index fixture shows various positions in which the rod and cap are held while machining.



(Lower Left) One of battery of Landis Semi-Automatic Grinders especially built for finish grinding camshaft main bearings. It is equipped with an automatic mercury sizing gage for each bearing.



and many other items mentioned later and listed on the machine shop routings.

Quality control plays a major role both on machine lines and inspection of the finished product. Many of the best known inspection devices such as the Sheffield gages, the Electro-limit equipment, and Jo-blocks, have been impressed to further this end.

General Plan

The floor plan reproduced elsewhere, will enable the reader to visualize the simplicity of the plant layout, the skill with which the machine shop and sub-assembly operations have been coordinated with the two final assembly lines. It might be mentioned at this point that due to the fundamental differences in the final assembly of L-head and valve-in-head engines, there is a separate assembly line for each one.

Machine shop operations begin at the front end where the cylinder blocks are handled. The flow of materials has been so arranged as to feed the final assembly lines, at the right, approximately at the point of usage. Note how the succession of departments—cylinder blocks, camshafts and crankshafts, pistons and connecting rods, flywheels, cylinder

Conveyor Data

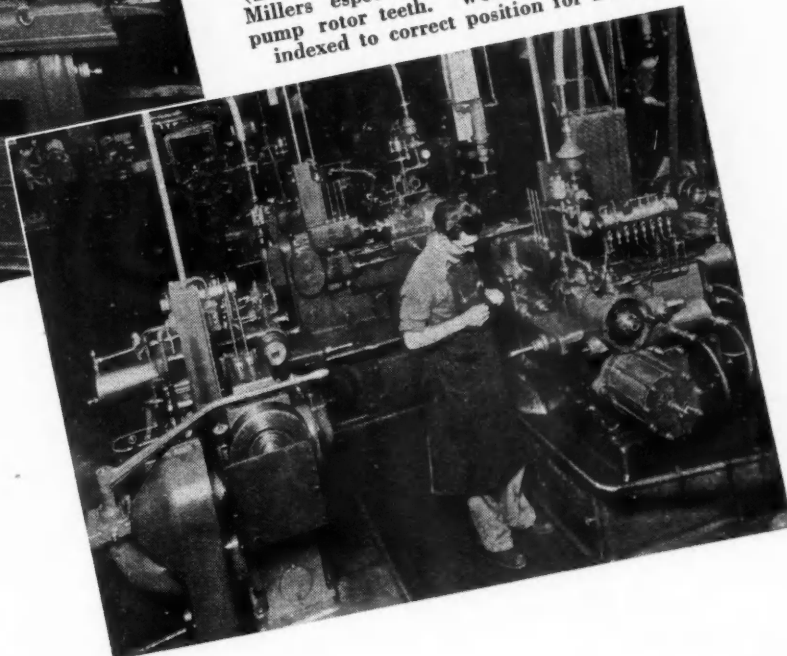
Truck Engine Works,
International Harvester Company

DESCRIPTION	TYPE	LENGTH IN FEET
HD Assembly Line	Pallet	250
FAB and FBB Assembly Line	Trolley	480
Stock Conveyors	"	4,150
Crankshaft	"	350
Piston and Connecting Rod	"	700
Head and Manifold	"	300
Block Test	"	1,400
FAB and FBB Sleeves	Roller	302
FAB and FBB Bearing Caps	"	160
FAB and FBB Crankcase	"	1,050
FAB Connecting Rod	"	103
FBB Connecting Rod	"	119
FBB Flywheel Housing	"	100
FAB Flywheel Housing	"	301
FAB Flywheels	"	454
FBB Flywheels	"	169
FBB Lower Cylinder Head	"	240
FAB Cylinder Head	"	218
FAB and FBB Gear Case Cover	"	105
FBB Upper Cylinder Head	"	125
FBB Manifolds	"	246
FAB Manifolds	"	272
FAB and FBB Cylinder Block	"	200
FAB and FBB Oil and Water Pumps	"	186
Miscellaneous Parts	"	204
HD Cylinder Block	"	813
HD Crankshaft	"	340
HD Pistons	"	190
HD Connecting Rod	"	275
HD Flywheel Housing	"	248
HD Flywheels	"	231
HD Cylinder Head	"	113
HD Manifolds	"	274
HD Cylinder Head	"	50
HD Motor Assembly	"	527



(Left) Heavy-duty Potter & Johnston automatic machine for turning, boring, reaming, facing, and rough and finish grooving the fan drive pulley.

(Below) Battery of three Sundstrand Stub Millers especially tooled for milling oil pump rotor teeth. Work is automatically indexed to correct position for milling.



heads, etc., ties in with the general sequence of operations on the motor assembly lines.

The floor plan also shows how well the various departments are linked by means of overhead conveyors and other types of materials handling equipment. All rough stock and parts

are delivered through the manufacturing building directly to the points where they are needed, few pieces ever touching the floor. More than three miles of conveyors in the manufacturing building, divided about equally between the roller type and the trolley type, reduce to a minimum the trucking of stock and parts.

Several standard types of materials handling systems are in use in the manufacturing building, including a total of 8200 lineal feet of roller conveyors between the various machine operations and the assembly lines. In some instances parts are placed in tote pans or on pallets, but wherever

possible the parts are placed directly on the rollers.

Six separate trolley conveyor systems are found in the manufacturing building, totaling over 8000 lineal feet, carrying 3000 hooks. The longest trolley conveyor, that for delivering materials from the stores department through the manufacturing building, extends for a little less than half a mile. Flat trays suspended from the conveyor take care of all cartons and boxes that are easily loaded and unloaded. The conveyor has a variable speed of 16 to 48 ft. per min. and will make from two to six round trips per 8-hour shift.

Thirty Cleveland tramrail systems, including both the monorail and crane type, also have been installed. Both electric and hand rope hoists are used in connection with the tramrail systems, depending on the nature of the load and with consideration for the safety of employees.

Valve-in-head type engines are assembled in trunnion fixtures, held in a yoke suspended from a trolley conveyor. L-head engines are partly assembled on pallets moved on a roller conveyor, and at about the middle of the line are transferred to horizontal indexing pallets mount-

Factory Routing—Crankshaft

Truck Engine Works, International Harvester Company

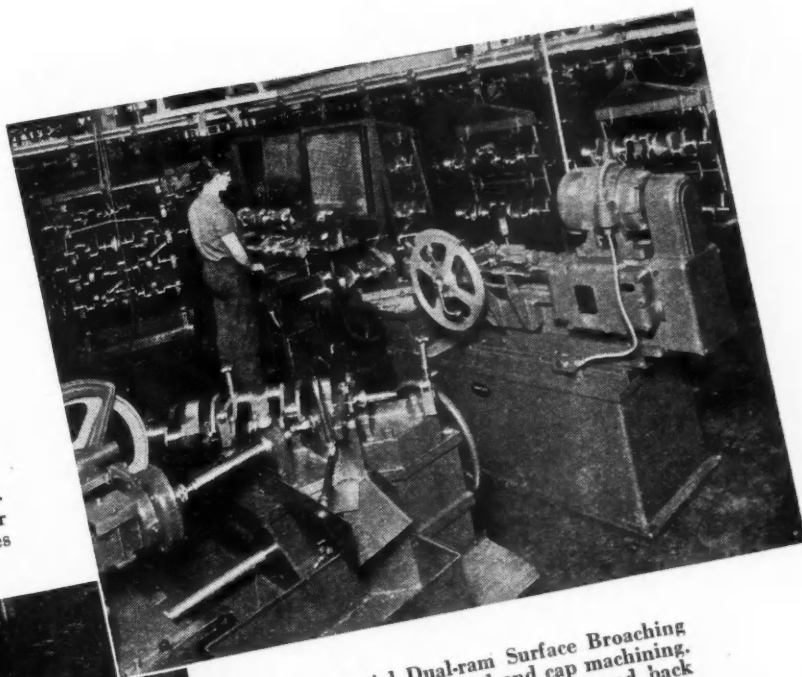
OPERATION	EQUIPMENT	OPERATION	EQUIPMENT
Forgings purchased heat treated, straightened, and centered		Grind side wall and outside diameter of No. 1 main bearing	10 in. x 36 in. Landis Type "D" hydraulic grinder
Turn outside diameter of counterweights	4 in. x 26 in. Lo-Swing lathe	Grind face of No. 1 main bearing for thrust and grind outside diameter of gear fit diameter.	10 in. x 36 in. Landis Type "C" hydraulic grinder
Mill locating spots on No. 1 and No. 6 throws	Newton special crankshaft milling machine	Grind side walls and outside diameter of No. 4 main bearing	10 in. x 36 in. Landis Type "D" hydraulic grinder
Turn thread, pulley fit, gear fit Nos. 1, 2, 3 and 4 main bearing and flange diameters. Rough form oil sling and flywheel bolt lock diameter. Face cheeks at Nos. 1, 2, 3 and 4 main bearings	7 ACL LeBlond automatic crankshaft line bearing lathe	Grind outside diameter of flange	10 in. x 36 in. Landis Type "C" hydraulic grinder
Check for straightness and straighten when necessary	20-ton No. 203 General Flexible power press	Grind pulley fit and thread diameters	10 in. x 36 in. Landis Type "C" hydraulic grinder
Finish form oil sling and bolt lock diameters. Face and chamfer thread, gear fit and No. 1 main bearing diameters. Chamfer outside diameter of flange	8 ACL LeBlond heavy-duty automatic finish turning lathe	Grind side walls and outside diameter of 6 pin bearings	16 in. x 42 in. Landis Type "D" hydraulic grinder
Mill excess stock between cheeks on No. 3 and No. 4 pins	(2) Newton special one-way unit hand mill	Cut oil thread and file burrs	16 in. Springfield engine lathe
Face cheeks and turn (6) pin bearings	6 AC LeBlond automatic double spindle crankshaft pin lathe	Drill grease pocket hole in flange end	Colburn No. 2 2-spindle drill press
Drill oil holes, from No. 1 main bearing to No. 1 pin bearing and from No. 4 main bearing to No. 6 pin bearing	Leland-Gifford 2-spindle automatic drill press	Counterbore flange for clearance	No. 242 Barnes single-spindle drill press
Drill oil holes from No. 2 main bearing to No. 2 pin bearing and from No. 3 main bearing to No. 5 pin bearing	Leland-Gifford 2-spindle automatic drill press	Straighten	20-ton General Flexible press
Drill oil holes from No. 2 main bearing to No. 3 pin bearing and from No. 3 main bearing to No. 4 pin bearing	Leland-Gifford 2-spindle automatic drill press	Finish face flywheel contact face of flange. Chamfer outside diameter of flange and recenter flange end	18 in. x 8 ft. LeBlond engine lathe
File burrs from outside diameter of cheeks and from locating spots	Bench	Drill (4) flywheel bolt and (2) dowel holes in flange	32 in. Cincinnati-Bickford drill press
Straighten	No. 203 20-ton General Flexible press	Mill Woodruff Keyways in pulley fit and gear fit diameter and burr (6) flange holes and (2) keyways	Kent-Owens hand mill
Grand side walls and outside diameter of No. 2 and No. 3 main bearings	10 in. x 36 in. Landis Type "D" hydraulic grinder	Balance. (Dynamic)	No. 3-S Olson balancing machine
		Drill holes for balance	Barnes single-spindle drill press
		Balance. (Static)	Micro-Poise balancer
		Snag grind for balance, when necessary	No. 74 Safety 2-wheel snag grinder
		Burr complete and break corners at ends of (6) oil holes	16 in. Von Wyck engine lathe
		Mill starting nut thread	Lees - Bradner standard thread mill
		Finish straighten	8-ton General Flexible press
		Wash and brush chips from oil holes and lap (4) main bearings and (6) pin bearings	Schraner hydraulic lap-ping machine
		Wash	
		Inspect	Blakeslee washing machine

ed on a power-driven conveyor for completion.

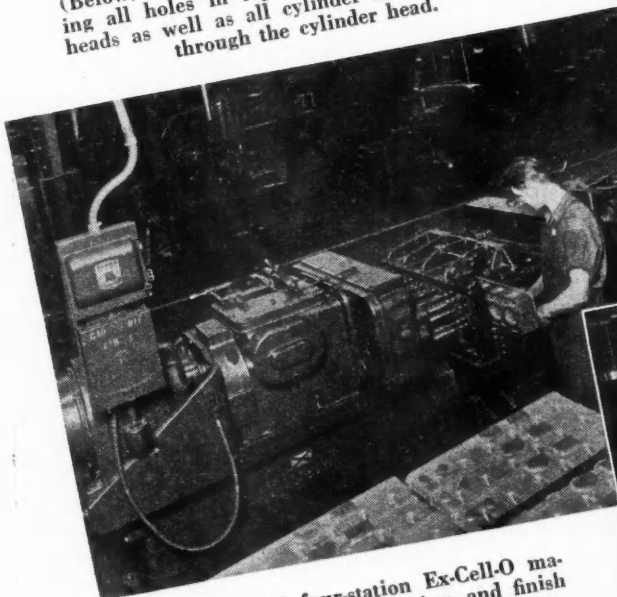
Complete engines are transferred from the ends of their assembly lines to a trolley conveyor which carries them to the engine test room. After testing, the engines are hung on the same conveyor, proceed through the paint spray booth and out onto the loading dock for shipment by rail or truck.

(Right) A section of the crankshaft balancing department showing a special-built Snyder machine for balance drilling. In center is a Tinius-Olsen Balancing machine which balances crankshafts dynamically and statically to 0.4 ounce-in.

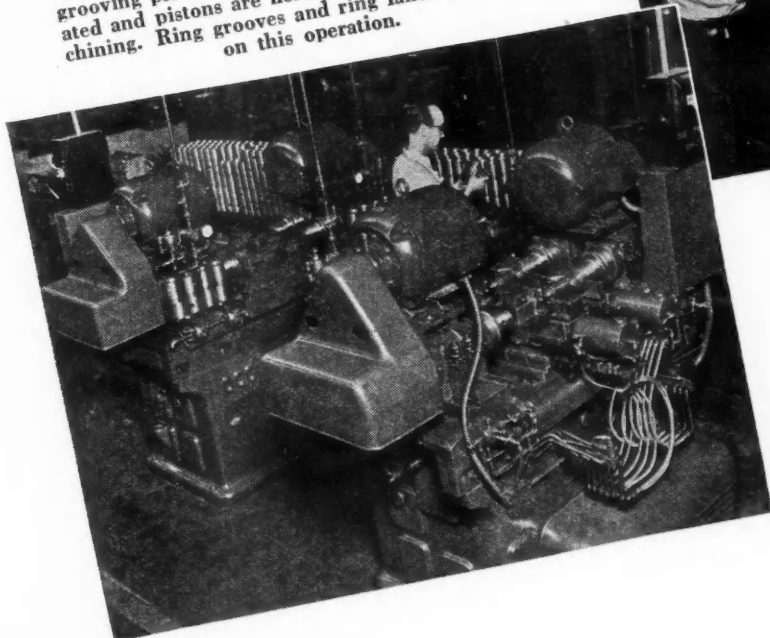
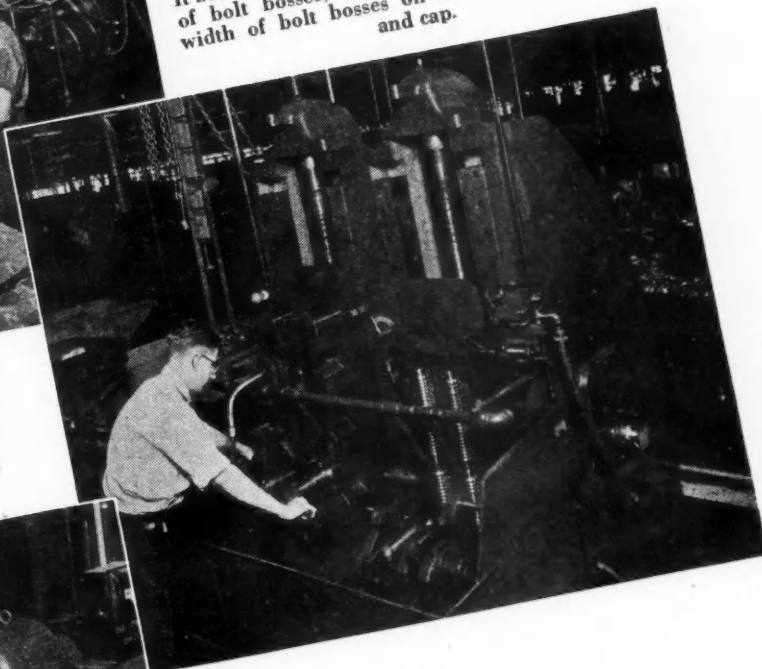
(Below) Foote-Burt two-way machine for drilling all holes in top and bottom of cylinder heads as well as all cylinder head stud holes through the cylinder head.



(Below) Colonial Dual-ram Surface Broaching machine for connecting rod and cap machining. It broaches both sides of crank bearing end, back of bolt bosses, half holes, contact faces, and width of bolt bosses on both connecting rod and cap.



(Below) Two special four-station Ex-Cell-O machines for finish turning, finish facing, and finish grooving pistons. Machines are hydraulically operated and pistons are held by air chucks while machining. Ring grooves and ring lands are finished on this operation.



Surface Broaching

From the viewpoint of general interest, the spotlight surely is on the surface broaching equipment installed in this plant. At least one of the machines represents about the largest of its type in use in the entire industry. The following notes give the significant details of four outstanding surface broaching operations, illustrated in the pictorial section.

1.—Cincinnati double-ram broach for finishing both sides, top of bolt

Routing—Cylinder Block

Truck Engine Works, International Harvester Company

OPERATION	EQUIPMENT	OPERATION	EQUIPMENT
Mill locating pads	Newton Type "C" special vertical milling machine	Semi-finish bore cylinders	No. 10 special 3-spindle moline cylinder - boring machine
Rough and finish mill top and bottom	Newton heavy-duty drum-type mill	Rough bore crankshaft and camshaft bearing holes	W. F. & John Barnes No. 420 single-head hydraulic feed boring machine
Drill and ream locating holes	No. 210 Barnes Drill Co. box column single-purpose drill	Semi-finish bore camshaft and crankshaft bearing holes	W. F. & John Barnes single-head horizontal boring machine
Mill manifold side	Newton heavy-duty open-side straight line mill	Mill oil groove in rear bearing and straddle face front bearing and chamfer	Newton double-end planetary-type mill
Mill ends	Newton No. O-HA drum-type unit head mill	Chamfer bottom of cylinder bores	42-in. Cincinnati Bickford upright drill
Broach bearing cap seats and crankshaft bearing half holes	Special Cincinnati horizontal broaching machine	Mill fuel pump and generator pad	Newton Type "C" sliding head milling machine
Drill oil gallery holes; core drill end camshaft bearing holes; counterbore Welch plug hole in rear end; bore and face bottom of water pump impeller hole; drill timing chain oil hole in front end; tap front end of oil gallery hole and counterbore rear camshaft bearing hole for Welch plug	W. F. & John Barnes horizontal duplex drill	Bore oil pump and distributor hole, semi-finish oil pump pad and finish face and counterbore distributor pad	W. F. & John Barnes horizontal boring machine
Rough bore cylinders	No. 10 special Moline cylinder boring machine	Line ream distributor and oil pump shaft hole and finish face oil pump pad	W. F. & John Barnes horizontal single-end reaming machine
Straddle mill sides of main bearings and cut lock slots	C-74-A Newton rise and fall milling machine	Open-valve throat holes	W. F. & John Barnes 12-spindle drill
Drill (13) holes in front end and (10) holes in rear end	W. F. & John Barnes horizontal duplex drilling machine	Drill valve guide and valve lifter holes	W. F. & John Barnes horizontal duplex hydraulic drilling machine
Drill (16) holes and chamfer (9) port holes in manifold side; drill (7) holes and counterbore (5) Welch plug holes in opposite side; drill (2) vent holes in top.	W. F. & John Barnes No. 420 horizontal duplex drilling machine	Drill (12) oil holes in valve lifter guides	Foot-Burt No. 15½A-12-spindle drilling machine
Drill (32) holes in top and (33) holes in bottom and burr complete	W. F. & John Barnes No. 430 horizontal duplex multiple spindle hydraulic drilling machine	Back counterbore (12) valve spring seats	12 in. W. F. & John Barnes 12-spindle drilling machine
Tap (21) holes in top and (33) holes in bottom	W. F. & John Barnes Horizontal Duplex Tapping	Rough ream valve guide and valve lifter holes; bore and counterbore exhaust and bore intake valve seat holes	24-spindle W. F. & John Barnes hydraulic drill
Drive in Welch plugs and water test	Roller conveyor and water test fixture	Line ream valve guide and valve lifter holes	2-spindle Moline hydraulic valve reaming machine
Tap (12) holes in front end, (3) holes in rear end and (16) holes in manifold side	W. F. & John Barnes 3-way lead screw tapping machine	Press in (6) intake and (6) exhaust-valve guides	30-ton 18 in. American vertical broach press
Drill (4) main bearings to camshaft bearing oil holes; (4) holes from oil gallery to main bearing oil holes; (1) distributor hole; (1) distributor dial screw hole; (1) oil pump hole, and counter-sink, spotface, counterdrill and ream oil relief hole.	W. F. & John Barnes 3-station drilling and tapping machine	Finish bore for exhaust-valve seat rings and cut intake-valve seats	No. 920 12-spindle W. F. & John Barnes hydraulic vertical drilling machine
Blow out bearing capscrew holes and assemble bearing caps and shims and tighten capscrews	Conveyor	Press in (6) exhaust-valve inserts	20-ton general flexible press
Core drill oil filler tube hole, drill and tap (2) oil pump stud holes, tap (4) pipe plug holes, ream oil filler hole, drill (2) oil seal packing holes, drill (1) oil return hole, (1) oil suction hole, (1) oil pan mounting hole in rear main bearing cap. Drill (1) angular hole in oil pump hole. Tap (2) pipe plug holes; tap (1) angular hole; tap (1) oil relief plug hole; tap (1) distributor dial hole; tap (2) flywheel housing holes.	W. F. & John Barnes 3-way drilling and tapping machine	Roll in (6) exhaust-valve inserts	Cincinnati Bickford single spindle drill
		Finish mill rear end	No. 1402 Milwaukee mill
		Precision bore crankshaft and camshaft bearings	W. F. & John Barnes precision boring machine
		Press in front camshaft bearing bushing and hand line ream	5-ton oil gear horizontal press
		Precision bore cylinders	6-spindle W. F. & John Barnes inclined boring machine
		Chamfer top of cylinder and file top by hand	Conveyor
		Rough hone cylinders	6-spindle Moline hole hog hone
		Finish hone cylinders	3-spindle Barnes Drill Co. hydraulic hone
		Grind exhaust-valve seats	Special Hall grinder unit
		Grind intake-valve seats	Special Hall grinder unit
		Wash and blow off with air	Blakeslee washing machine
		Inspect	

boss, bore of cap, and contact face of cylinder block bearing caps.

Number of pieces per hour.. 112
 Surface speed of ram 25 f.p.m.
 Total amount of metal removed per surface $3/32$ in.
 Tolerance 0.002 in.

2.—Special-built Cincinnati horizontal broach for broaching crankshaft bearing bore and sides for bearing cap lock in cylinder block. This improved method assures accuracy in alignment of crankshaft

bearings as well as size and finish.

Number of pieces per hour.. 40
 Surface speed of ram 35 f.p.m.
 Total amount of metal removed per surface .. $1/16$ to $3/32$ in.
 Tolerance 0.002 in.

3.—Colonial dual-ram surface broaching machine for connecting rod and cap machining. It broaches both sides of crank bearing end, back of bolt bosses, half holes, con-

tact faces, and width of bolt bosses on both connecting rod and cap.

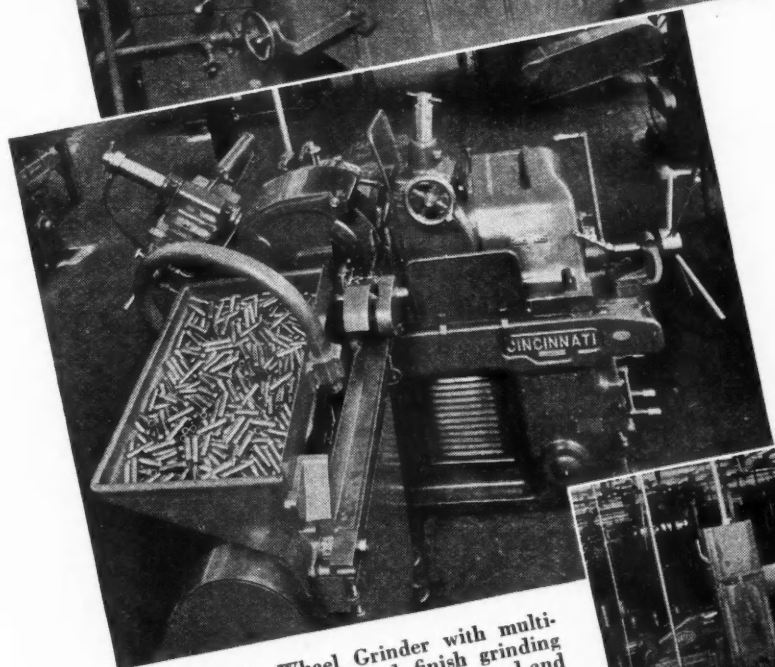
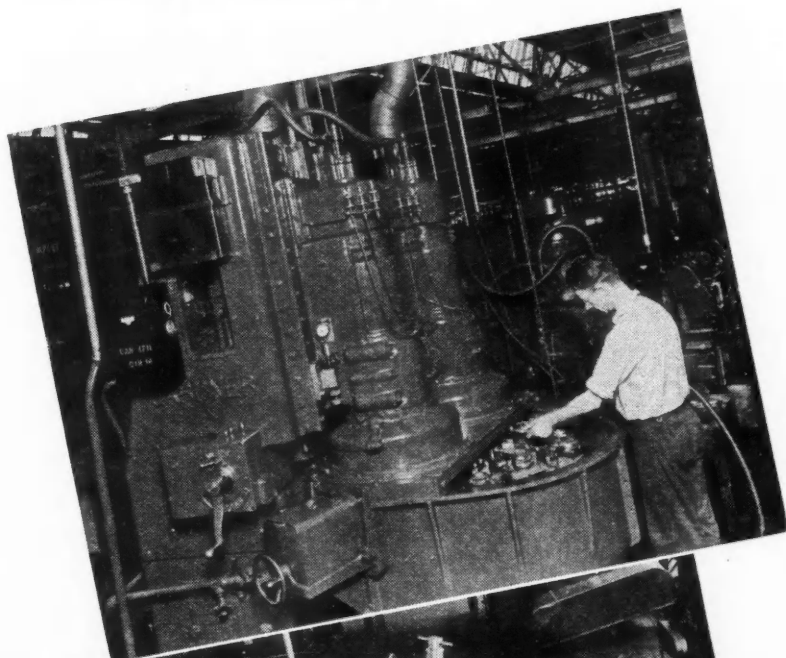
Number of pieces per hour.. 50
 Surface speed of ram 5.5 f.p.m.
 Total amount of metal removed per surface... $1/16$ to $3/32$ in.
 Tolerance 0.002 in.

4.—Single-ram horizontal Cincinnati broach especially built for the International Harvester Company for broaching the top and bottom of cylinder heads. This machine is equipped with a power-operated index fixture which enables the operator to load one station of the fixture while the machine is in operation. Operated by push button, the machine is fully automatic and is equipped with an electric eye which will not permit the machine to operate if there is misalignment of the piece in the fixture, thus eliminating the possibility of breaking broach inserts. The ram is powered by five centrifugal hydraulic pumps.

Number of pieces per hour.. 76
 Surface speed of ram 42 f.p.m.
 Total amount of metal removed per surface..... $3/32$ to $1/8$ in.
 Tolerance 0.002 in.

Machine Shop High Spots

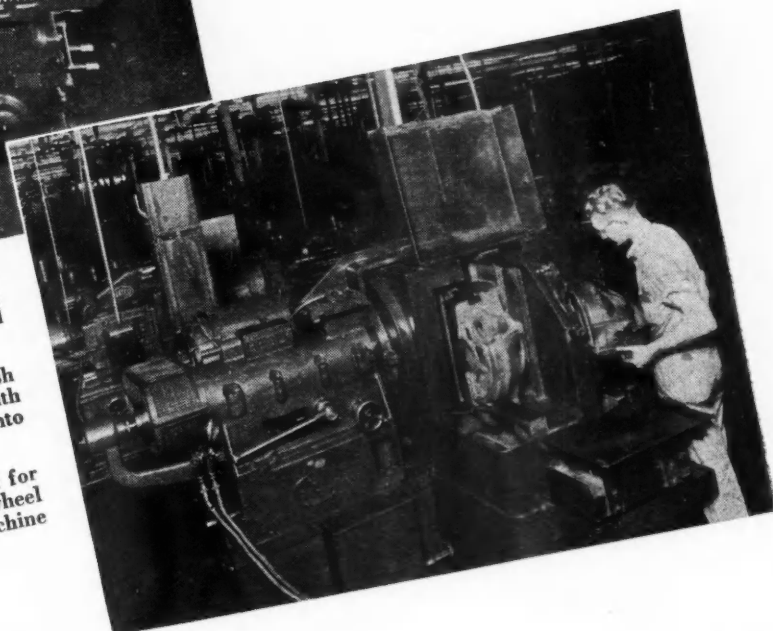
The first production line to be noted is that of the cylinder block. A Newton heavy-duty drum-type mill is used for rough and finish milling of the top, bottom, and ends of the cylinder block in a fixture that holds five blocks at a time. The special Cincinnati hydraulic horizontal broach finishes the main bearing cap seats and semi-finishes the main bearing shell half holes. Main



(Top) Gardner Double-Wheel Grinder with multi-station rotary fixture for rough and finish grinding both sides of crank bearing end of connecting rod and cap assembly.

(Above) Cincinnati Centerless Grinder for finish grinding valve guides. This machine is equipped with a Danly automatic hopper for feeding the work into the machine.

(Right) Besley Double-end Surface Grinder used for finish grinding front and rear end of the flywheel housing. The part is finish ground on this machine from the rough casting.



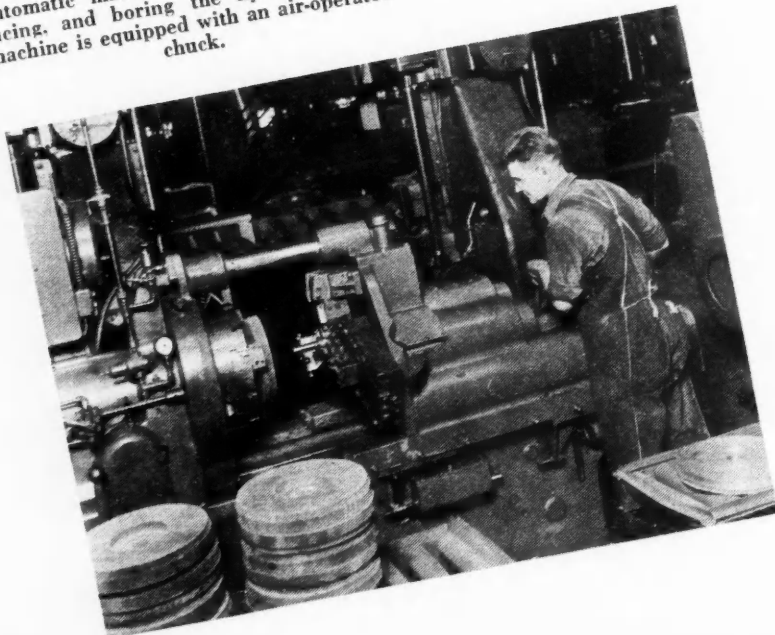
bearing shell half holes are bored on a W. F. & John Barnes precision boring machine after the bearing caps are assembled. Camshaft bearing bores are bored on this machine while the crankshaft bearing bores are finish-bored. The entire cycle is automatic and electrically interlocked.

Perhaps the most striking of the machine operations on the cylinder block line are those performed by the two new W. F. & John Barnes three-station automatic drilling and tapping machines. The cylinder block indexes to position and raises the clamp at which time the drilling or tapping units start with quick approach, feed, and automatic return to neutral position. The block then is automatically lowered and indexed to the next station. This operation is repeated at each of the three stations. The machine delivers a block with 29 holes, drilled, and 17 holes, tapped, in each cycle.

Cylinders are finish bored on a W. F. & John Barnes inclined-way precision boring machine to very close tolerances. Following this operation the cylinders are honed on Barnes machines fitted with Micro-matic honers.

The valve guide machine line is arranged to produce the guides adjacent to the location where they are pressed into the cylinder block. In this short progressive line is some of the most modern equipment to be found anywhere,—two, six-spindle

One of battery of Radial-type Gisholt automatic machines for rough turning, facing, and boring the flywheel. This machine is equipped with an air-operated chuck.



Factory Routing—Flywheel

Truck Engine Works,
International Harvester Company

OPERATION	EQUIPMENT
Rough turn and chamfer ring gear diameter; turn ring gear stop shoulder on outside diameter; rough and semi-finish face crankshaft side. Rough bore crankshaft flange register and clutch shaft pilot bearing bore	Gisholt Simplimatic lathe.
Rough face clutch side; rough turn outside diameter on clutch side; bore and form oil slinger	(2) Gisholt Simplimatic lathes
Finish bore crankshaft flange register. Finish bore and chamfer clutch shaft pilot bearing bore. Finish face crankshaft side and semi-finish turn ring gear diameter	Gisholt Simplimatic lathe
Drill (6) clutch mounting cap screw holes, (4) flywheel to crankshaft bolt holes and (2) dowel holes	Model "A" Type 13 Natco multiple drill
Hand-ream crankshaft register and clutch shaft pilot bearing diameters	Bench with fixture and step reamer
Finish face clutch face. Finish turn and finish chamfer ring gear diameter, ring gear stop diameter and outside diameter at clutch side	Gisholt Simplimatic lathe
Tap (6) clutch mounting cap screw holes	No. 2-X Garvin tapper
Drill (3) oil holes in oil slinger and counterbore (6) clutch mounting cap screw holes.	2-spindle Type PF Allen drill
Surface grind clutch face	No. 22 Heald rotary surface grinder
Press and shrink ring gear on flywheel.	No. 1123 Junior Thrift gas oven, Hannlin air press Bench.
Re-hand ream crankshaft register and clutch shaft pilot bearing diameters	
Blow out tapped holes, balance and stamp light side	18 in. Gisholt 12-E static balancing machine
Inspect	

Gridley automatics, a Danly hopper-fed Cincinnati centerless grinder, and a Lo-Swing "IMP" automatic lathe with automatic loading mechanism.

On camshafts, the oil pump drive gear is hobbled on a battery of three Lees-Bradner hobbing machines. Bearings are rough and finish ground on Landis hydraulic grinders equipped with electric mercury gages for sizing the work automatically. Cam contours and fuel pump eccentric are rough and finish ground on Landis automatic cam grinders.

LeBlond crankshaft lathes are used for turning the main bearings on the crankshafts, while the latest-type LeBlond (2-station) crankshaft pin lathes are used for turning pins.

Sizes are maintained to such close tolerances as to make it possible to finish grind bearings and pins directly from these turning operations.

Tinius Olsen crankshaft balancing machines are used for balancing crankshafts statically and dynamically.

Main bearings and connecting-rod bearings are ground to size on Landis hydraulic grinders. After grinding they are polished on Schraner hydraulic polishing machines.

Piston machining is in keeping with the most advanced practices. Rough and semi-finish turning operations are performed on Sundstrand stub lathes, Gisholt automatics, and Barnes automatic lathes. The Ex-Cell-O precision turning machine finish-turns the O.D. of the body and ring lands, finish cuts the ring grooves, and finishes the piston head. The body of the piston is ground on a Cincinnati No. 5 centerless grinder. This machine boasts six 4-inch wheels making it possible to maintain tolerances to within 0.0002-in. for out-of-round and taper.

Wrist pin holes are precision-bored on an Ex-Cell-O, two-spindle, double-end, precision boring machine after which the pin holes are lapped to size. Pistons then are passed through a Blakeslee washing machine prior to final inspection for weight and size. They are then sent by overhead conveyor to the assembly line.

Some of the most modern equipment is employed in machining connecting rods. Here, for example, is a Colonial dual ram broach for broaching both sizes of the crank hole boss, both ends and sides of the bolt hole bosses, and the crank hole radius in the rod and cap. After the rods and caps are assembled, both sides of the crank hole boss are rough and finish ground on a Gardner double wheel surface grinder. The large bore and piston pin hole are finish align-bored on a 4-spindle, double-end Ex-Cell-O precision boring machine. Six-spindle Pratt and Whitney deep-hole drills are used to rifle-drill the oil hole from the connecting-rod bearing to the piston pin hole.

A battery of six Gisholt Simpli-matic lathes completes the rough and finish turning of flywheels. The clutch face is ground smooth on a Heald grinder before the ring gear is shrunk on. All flywheels are balanced on a Gisholt balancer.

All holes in the transmission contact face and motor contact face are drilled and bored on a Greenlee two-way horizontal drilling and boring

machine. The transmission contact face and bore are finish-bored and milled after assembly to the cylinder block on a W. F. & John Barnes planetary mill to insure perfect alignment of the transmission with the engine.

One of the most interesting pieces of equipment in the cylinder head line is the huge Cincinnati single-ram horizontal broaching machine for surface broaching the top and bottom sides of the cylinder head. In each forward stroke of this machine the top side of one cylinder

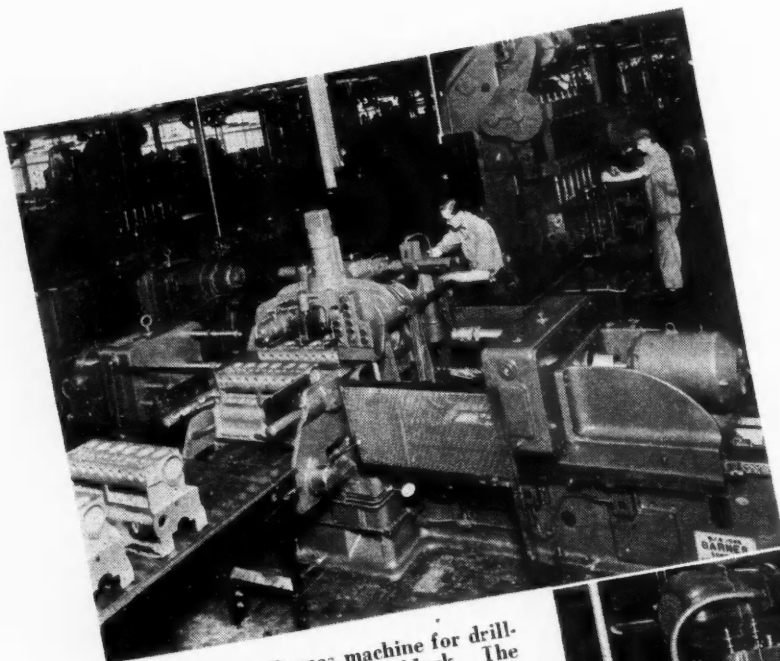
head and the bottom side of another are machined, producing one complete cylinder head in each cycle. During the forward stroke of the machine, the operator loads a rough head in the first position and transfers the semi-finished head from a cradle mounted on the fixture trunnion into the second position. At the completion of the forward stroke of the ram the indexing drum indexes 90 degrees.

A battery of Lees Bradner and Barber-Colman hobbing machines is used for cutting teeth in timing

Factory Routing—Piston

Truck Engine Works,
International Harvester Company

OPERATION	EQUIPMENT
Rough casting received annealed and sealed inside	
Rough bore and rough face skirt	No. 12 Gisholt automatic lathe
Drill piston pin hole	Davis & Thompson 12-spindle rotary drilling machine
Rough turn outside diameter	10 in. Sundstrand stub lathe
Semi-finish turn outside diameter and ring lands; rough cut ring grooves and rough face top end	17 in. Barnes automatic lathe, 10 in. Model "B" Sundstrand automatic lathe, 12 in. Gisholt hydraulic automatic lathe
Finish bore, face and chamfer open end and center top end	(2) 10 in. Model "B" Sundstrand automatic lathes
Finish turn outside diameter and ring lands. Finish cut ring grooves and finish face top end	(2) Excelllo precision turning machines
Rough grind outside diameter of body	No. 2 Cincinnati centerless grinder
Rough bore piston pin hole	3-spindle Excelllo precision boring machine
Face inside of piston pin bosses and cut piston pin retainer grooves	Excelllo special machine
Weight and bore to weight	No. 9 Natco single-purpose Hi-Duty drill. Toledo scale
Wash	Blakeslee washing machine
Finish grind outside diameter	No. 5 Cincinnati centerless grinder
Wash	Blakeslee washing machine
Finish bore piston pin hole	(2) Excelllo 2-spindle double-end precision boring machine
Drill oil holes in piston pin bosses	Edlund No. 1-B-1 high-speed drill
Drill oil return holes in lower ring groove	Kingsbury single-spindle B-A drilling machine
Lap and chamfer piston pin hole	Model "L" Sunnen lapper with chamfering attachment
Wash	Blakeslee washing machine
Weigh	Toledo scale
Inspect, cannon gage, and stamp size. Gage and mark with paint for piston pin hole sizes	Bench



Two-way W. F. and John Barnes machine for drilling and boring both ends of cylinder block. The oil gallery hole is drilled on this machine, half way through from each end of block.

gears. The timing gear teeth are finished on Michigan shaving machines.

Engine Assembly

The assembly line for L-head engines was favored in making the layout since it is the high production line with a maximum schedule of 500 engines per day. Beginning at a point in the front end of the building this assembly line runs in a straight line for 490 feet. The first 250 feet consists of a 14-in. roller conveyor with pallets.

At this point the engines are transferred to a power-driven conveyor which at 5-foot intervals has steel pallets onto which the engines are placed. These pallets allow engines to be indexed in any one of eight horizontal positions.

The assembly line for valve-in-head engines has a maximum production schedule of 180 engines per day and runs parallel to and within 20 feet of the light truck engine assembly line. It is an overhead trolley conveyor with assembly carriers spaced every 10 feet. The carriers are so made that the engines may be indexed in any one of eight positions in a vertical plane to facilitate assembly. Suspended from a trolley duct that runs between and the entire length of the two assembly

lines are 40 power-driven wrenches (electric and air).

A three-day supply of stock is kept along the assembly lines, the majority of it in tote pans which slide into special tote-pan racks.

The cylinder head assembly is made up complete, including spark plugs as a subassembly. This is also true of the intake and exhaust manifolds, which are mounted on the engine as a complete subassembly.

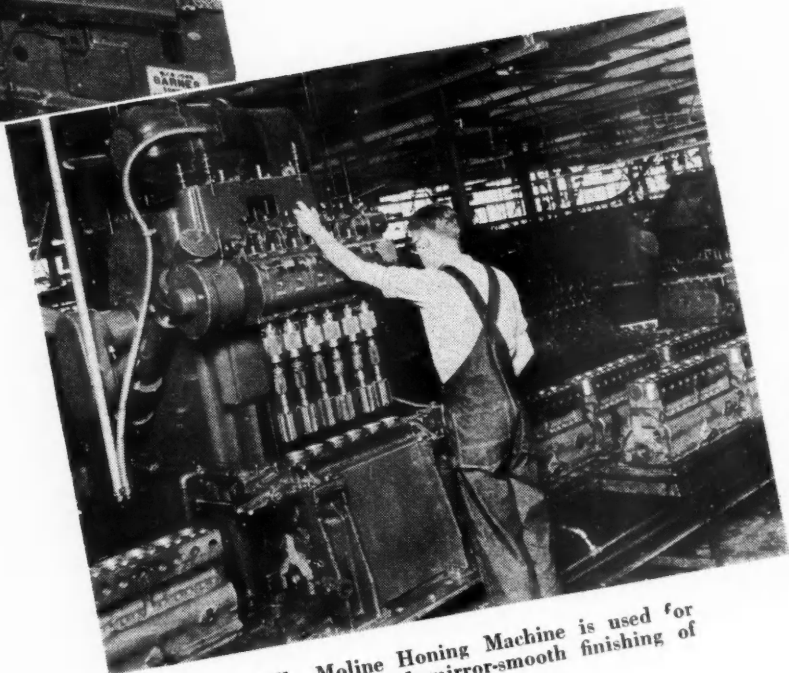
The last operation on the assembly line is the placing of a special steel hook on the engine for transfer to the block test conveyor. A crew of inspectors is constantly at work checking for quality, accuracy, cleanliness, and conformity to engineering tolerances, seeing that the various assembled parts have proper running clearances.

Assembled engines are delivered

to the block test room by a conveyor that accommodates both assembly lines. Here dynamometer stands are provided with water, oil, gas, and electrical connections so that the engines can be run either idle or under load.

L-head engines all are run at three different speeds, ranging from 800 r.p.m. to 1500 r.p.m. for the last half hour.

Valve-in-head engines all are run in on dynamometer test stands at two speeds. They are run the first



Six-spindle Moline Honing Machine is used for accurately sizing and mirror-smooth finishing of cylinder bores.

hour at 800 to 1500 r.p.m. and the last half hour at 1750 r.p.m.

After engines are run-in all are placed in tear-down stands, the oil pans removed, and all bearings inspected. The oil pans are washed, put back on the engines, and the engines are placed on the trolley conveyor.

For test purposes three silent test rooms are located at each end of the block test department. Three Cleveland tramrail cranes serve to transfer the engines between the test stands and trolley conveyor.

After leaving the block test room the conveyor carries the engines through a water-wash type spray booth where paint is applied. The paint has thoroughly dried by the time the conveyor delivers the engines to the loading dock where the

(Turn to page 743, please)

Progress in the Oil Industry

By J. HOWARD PEW*

WHEN I accepted the invitation to speak here today* it was in my mind to make the orthodox address, beginning with the announcement that our industry confronts a crisis, and then advising as to what we should do about it. Ever since I can remember, we have been hearing that a crisis was upon us. That has been our experience so long that it would be a lonesome business to meet in annual convention and not have our crisis with us. Most commonly, our critics have attributed the crisis to competitive conditions; one group insisting there was too much competition, the other that there was not enough. Which-ever it was, they could at least agree that because of it the industry was in a bad way. Half the diagnosticians believe the industry is insanely competitive; the other half believes it has throttled competition and become an unholy monopoly.

Personally, I accept neither diagnosis. I think we have plenty of competition. I think it is good for us. Unfortunately, the judicial and legislative surgeons have the last guess. They will decide whether, and how, the industry is to be operated on. So I have thought that before the patient goes under the anesthetic, we might well consider briefly his background, habits, and previous condition of servitude—in short, his case history. I shall begin by developing my view that there is plenty of competition, and that it is good for us. After that, I propose to tell you what I think is the real crisis before us.

The petroleum industry, as we know it, was born not with the Drake well and the kerosene lamp, but with the development of the in-

is built on the foundation of competitive enterprise. Steady improvement of its products, lower prices, high industrial wages and increased payrolls during an unsettled economic period have resulted.

ternal combustion engine and the trick of hitching that engine to vehicles. The whole story scarcely covers a single generation. I can see here a goodly sprinkling of men who might say with the poet Vergil, "all of which I saw, a part of which I was."

Because it seems unavoidable in a logical presentation, I wish at the outset to note briefly some facts with which all of us are familiar. If the industry deserves to be branded as a monopoly, there must be some evidence of its monopolistic character. If our prices were excessive there would be innumerable complaints. Yet in all the investigations of the industry the thing that has most impressed me is that our customers never allege that we are overcharging them. More commonly they wonder that our products are so cheap.

It is true that price variations for gasoline as between different sales areas are sometimes criticized, although as to other than petroleum products such variations go unnoticed. I recall that a newspaper friend in Pittsburgh once demanded to know why gasoline should cost him a cent more in his home town than in Philadelphia. I replied by asking why a daily newspaper in Pittsburgh should cost 3 cents, while in Philadelphia it cost only 2 cents. That may not have been very logical, but it kept him busy long enough to

save me from a detailed analysis of marketing conditions in the two cities. Since then the discrepancy has been removed by increasing the price of Philadelphia papers to 3 cents—a 50 per cent boost that I have no doubt was thoroughly justifiable. But imagine the uproar that would follow a 50 per cent advance in gasoline price!

Our products scrape the bottom of the commodity price index. Thus in June, 1938, they stood at 56.3, as against 78.3 for "all commodities." And they have in recent years shown the greatest shrinkage in consumer price. In 1920 the country's average service station price of gasoline, ex-tax, was 29.74c. In 1926 it was 20.97c. Now, 1926 is commonly accepted as the post-war year of best equilibrium in prices. Well, if the 1926 price of gasoline, 20.97c., was fair, then there certainly can be little consumer complaint, because since 1926 it has fallen until on Oct. 1, 1938, the national average was 13.76c.—of course, exclusive of gasoline tax—and the lower price paid for a much higher quality of motor fuel. The index shows petroleum products today the cheapest commodities of general use.

Why, then, should suspicion point toward us in any discussion of monopoly? An analysis of the earnings of oil companies from 1921 to 1936 shows that the industry had deficits in four years and profits in twelve.

*An address given by the president of the Sun Oil Co., Philadelphia, at the nineteenth annual meeting of the American Petroleum Institute held in Chicago on November 14-18.

The highest yearly return on capital was 4.96 per cent; average yearly earnings were 1.357 per cent. It would be a mighty inefficient monopoly that could do no better than that!

But, even if prices are low and profits modest, is there some phase subject to criticism? Is it our attitude toward labor? A favorite diversion of monopoly is supposed to be grinding the face of labor. So, let us inquire how this industry has been treating its workers.

Department of Labor statistics say that in 1937 the payrolls in oil refining exceeded 1929 by over \$20,000,000. The average hourly refinery pay in 1937 was 97.2 c., which was more than 50 per cent above 1929, and the highest rate paid in any manufacturing industry. Weekly working hours averaged 49 in 1929 and 37 in 1937; but the average weekly wage in 1937—\$35.67—was higher than in 1929 and almost \$10 more than the average for all industrial workers. The refining industry showed one of the lowest rates of labor turnover, and there were 7½ per cent more employees in 1936 than in 1927. If all business had kept that pace there would be no unemployment problems today. The oil industry has been *lifting* the face of labor, rather than grinding it.

Summarizing our search for the stigmata of monopoly, we find that the oil industry charges the lowest prices for its products, pays the highest wages, increases employment right through the depression period—and earns less return on its capital than it would if that capital were invested in Government bonds. The stigmata of monopoly just are not there!

Expanding Production— Lower Prices

The petroleum industry has been built around the theory of big and expanding production at low and constantly lower prices. It is not only our biggest single industry, but it is our most impressive monument to the efficacy of unstinted competition. I mean the kind of competition that is always looking for better methods, improved processes, invention, discovery—that seizes upon every new idea looking to lower costs, better products, wider markets—that always gives the consumer the benefit of better goods at lower prices. It is the kind of competition that has demanded millions every year for work in laboratories and experimental plants—that has endowed scientific study and tireless research.

From one point of view it has been expensive competition, for it has demanded a constant reorganization and modernization of plants and processes to keep them in step. The establishment that is today's last word in progress, and has cost millions, is likely to be outmoded by next year; it must be brought up to date on pain of being elbowed out of the race. Yet this seeming wastefulness is in truth the essence of sound industrial economy. The fraction of a cent of saving per gallon, or the shade of improvement in quality, is quickly multiplied into wider acceptance, expanding volume, and strengthened position. These are the things which keep us constantly on the keen edge of competition, and which make competition a good thing.

Competition Prompts Improvements

Looking beyond the horizons of our own particular industry, I think we may emphasize this point by a brief consideration of the entire automotive group, among which petroleum is only one. This group most characteristically typifies the industrial trends of the present century. Casual recollection of horse-and-buggy days must impress how sweeping has been the revolution in manners of life and methods of industry. And the most striking thing about this automotive development has been its competitive character.

In that competition we have seen how the rugged individualist, Henry Ford, sturdily independent of finance capitalism, stock market appeal, or banking support, has found his place, maintained his independence, and reared an industrial structure that is one of the wonders of the business world. Yet right alongside of Henry Ford we have seen a score of great corporate concerns raising their capital from millions of investors and building up the same kind of business to the same pinnacle of success in the entirely different atmosphere of corporate organization.

So we see that within our American system of free enterprise there is always room, side by side, for colossal units of individual enterprise and towering structures of corporate organization. At the end of 1937, General Motors Corporation was owned by 375,755 stockholders; the Ford business by three. So long as such widely divergent types can grow and flourish, monopoly will be impossible.

If I may be pardoned a personal allusion in this connection, I think the experience of my own company,

though on a much smaller scale, illustrates the same point. By comparison with many of the greater corporate units in the petroleum industry, the Sun Oil Company is quite a modest little affair. Both its controlling ownership and its management have always been held within a single family. Its operations represent about 3 per cent of the country's petroleum industry, so I rate myself as a "small business man." Now, it is only about 13 years since we produced and marketed gasoline. At that time the industry, as we promptly learned, had grown to full adult stature; and we were left no room to doubt that it was thoroughly competitive. Nevertheless, our hopeful little enterprise was able to make a place for itself. We found no monopoly to freeze us out, and no excesses of competition to starve us out. We have never assumed a divine right to a place and a share in the industry. If somebody else could serve the public better in quality or price, he was entitled to the business. That is still our attitude, and the attitude of the industry. Everybody has recognized that his right to continue in business depends on his ability to give the public what it wants at prices it is both able and willing to pay. To live up to that formula has kept all of us scratching. It has been a case of root hog or die, and my agricultural friends tell me that the most vigorous rooter is usually the healthiest hog.

Public Supports Competition

Throughout the entire group of automotive industries the aim has always been for big volume, mass production, and low unit costs. The automobile manufacturers, under that formula, within a few years have put 30,000,000 cars on our American roads. In 1909 the average passenger car's wholesale value was \$1,252; in 1935 it was \$527—a reduction of 58 per cent. The car buyer of 1925 paid on an average \$31.50 per horsepower; in 1937 he paid \$8.60—a reduction of 72 per cent. Today the car's expectation of life is twice what it was 25 years ago. The tire for a light car, which cost \$20 or \$22 in 1914, now costs \$12 or \$13; today's tire is good for 25,000 miles or so; the 1914 tire was good for 3,500 or 4,000 miles. In a word, the cost of owning and operating a car today, mile for mile, is about one fourth what it was 20 years ago. And we must not forget that special taxes on the car and its fuel have built our good roads.

The automotive industries have

served the public well. They are free from monopoly, and competition has been a chief factor. Nevertheless, there is demand for government to invade the oil industry's field with measures which under the guise of helpful "regulation," would before long develop the paralyzing rigidities of government control.

It is at this point that we descry the real crisis that menaces the oil industry. On one side are those who believe in limiting the size of corporate units, and who demand such limitations. On the other side are those who raise the question whether, in present-day conditions, large units are not only necessary, but sometimes afford the best insurance against monopoly, the soundest guarantee of effective competition, and the surest protection of labor's rights.

Smaller Units Fostered

My own feeling is that if the great concerns can operate in the general interest, within our free enterprise system, then they should not be molested merely because of their size. But I strongly feel that we must foster the smaller units and give them such encouragement that they will always be part of our system. The small units of today will be the big units of tomorrow. Through them industry and enterprise must receive constant infusion of new blood, new talent, new energy and ever-widening outlook. We must have the smaller units as well as the larger, complementing each other, and together giving us a properly rounded and coordinated business structure. The discouragement of small business would shortly precipitate conditions in which all enterprise would be smothered.

I hope Senator O'Mahoney's Temporary National Economic Committee will thoroughly study all the evidence in these regards. Such a study, I am confident, will refute the theory entertained by some people that a few big oil companies dominate the market and fix prices. That is constantly disproved in day-by-day experience.

I have been at pains to inform myself about the experience of some large companies which have been in the gasoline business a good deal longer than I have. These companies all testify that while their *volume* of business has grown, their percentage of the *total business* has greatly shrunk through the years. How did it happen? The answer is that a good many of the small companies of 10, 20 and 30 years ago have been

getting increasing shares at the expense of the so-called "market leaders." Year by year leadership in either volume or price has tended to be diffused rather than concentrated; and that is another phase on which I hope the Temporary National Economic Committee will thoroughly inform itself, the public, and the lawmakers.

The instances just cited bring us back to the debate over whether there is an economic point beyond which the size of the industrial unit cannot grow. Personally, I think there is. Too wide a diffusion of managerial authority and responsibility carries with it the danger of a complexity of red tape, of weakening authority, and, in the vernacular, too much buck-passing. This point may vary greatly with different industries and organizations; but I am convinced that there is such a point; and that fact is a chief guarantee that there will always be room for the new ambitious, energetic and resourceful enterprises.

I think there will be little dissent from the view that if natural economic forces are adequate to keep business on a sound basis, there is no occasion for governmental interference. I mean *sound* from the standpoint of all concerned—owners, labor, management, customers and the public. Only when natural economic forces fail is there justification for governmental regulation—and then for only the minimum of regulation necessary to reestablish the sound basis.

Let me be quite clear on this matter. It is proper for government to lay down general rules to preserve competition, to prevent monopoly, to enforce sound business ethics. Having laid them down, government

should enforce them. But when the arm of government is thrust into the intimate workings of business, when government undertakes to dictate policy, to fix prices, to interfere with the very competition which it assumes to be protecting—then we have government *control*; and that is inevitably paralyzing to initiative, invention, adventure and enterprise.

Regulation may impose rules, to be enforced through the courts; but that is different from the *control* which enters the picture when a board, or commission, or other administrative authority is vested with managerial discretion, and, from the inside of the business structure, exercises at once the functions of the judicial, the administrative and the executive agencies. That is the domination that our ardent economic planners would have government exercise; the domination in which will be written the death sentence of free enterprise.

Our American system of free enterprise is far more than just a way of doing business. At its best it comprehends good sportsmanship, gives free play to the laws of supply, demand, and competition, develops discipline, character and initiative, raises the standard of living, and improves the morale of the people. When I speak of free enterprise at its best I mean when it is entirely free—free from monopoly, private or governmental; free from government control or intimidation; free from price or production controls after the manner of the cartel system in Europe.

My quarrel with the economic planners is based on my belief that they know so many things that simply are not true. They do their

(Turn to page 746, please)

FROM one point of view competition has been expensive, for it has demanded a constant reorganization and modernization of plants and processes to keep them in step. The establishment that is today's last word in progress, and has cost millions, is likely to be outmoded by next year; it must be brought up to date on pain of being elbowed out of the race. Yet this seeming wastefulness is in truth the essence of sound industrial economy. The fraction of a cent of saving per gallon, or the shade of improvement in quality, is quickly multiplied into wider acceptance, expanding volume, and strengthened position. These are the things which keep us constantly on the keen edge of competition, and which make competition a good thing.

DODGE TRUCK DIVISION OF CHRYSLER CORPORATION immediately preceding the opening of the New York national truck show announced a Dodge-built Diesel engine for its 3-ton trucks. This engine, we learn, is the result of several years' development work on the part of Chrysler Corporation's engineering laboratories.

The new engine is a full compression-ignition Diesel of 331 cu. in. piston displacement, with a torque rating of 226 lb.-ft. at 1000 r.p.m. and a power rating of 95 hp. at 2600 r.p.m. A compression ratio of 14.5 is used. The engine is of the familiar six-cylinder four-stroke-cycle type, of 3 $\frac{3}{4}$ -in. bore and 5-in. stroke. Its general dimensions, mounting, and crankcase structure are identical with those of the gasoline engine used for Dodge 3-ton trucks, which permits notable economies in engine production and in connection with the installation of the engines in the chassis. Its design embodies such well-known features as full-length water jackets, valve-seat inserts, a by-pass thermostat, and a chain-driven camshaft. The cylinder block is cast of nickel-molybdenum iron.

Tin-plated, steel-strut Autothermic pistons are employed, which permit of close piston fits. Pistons are 5 $\frac{15}{32}$ in. long, not including the height of the displacer cast integral with the top. Three compression and two oil rings are used, the top ring being $\frac{5}{8}$ in. below the top of the piston, so that it is always in contact with the watercooled portion of the cylinder wall. To prevent scuffing during the break-in period, the rings are tin-plated.

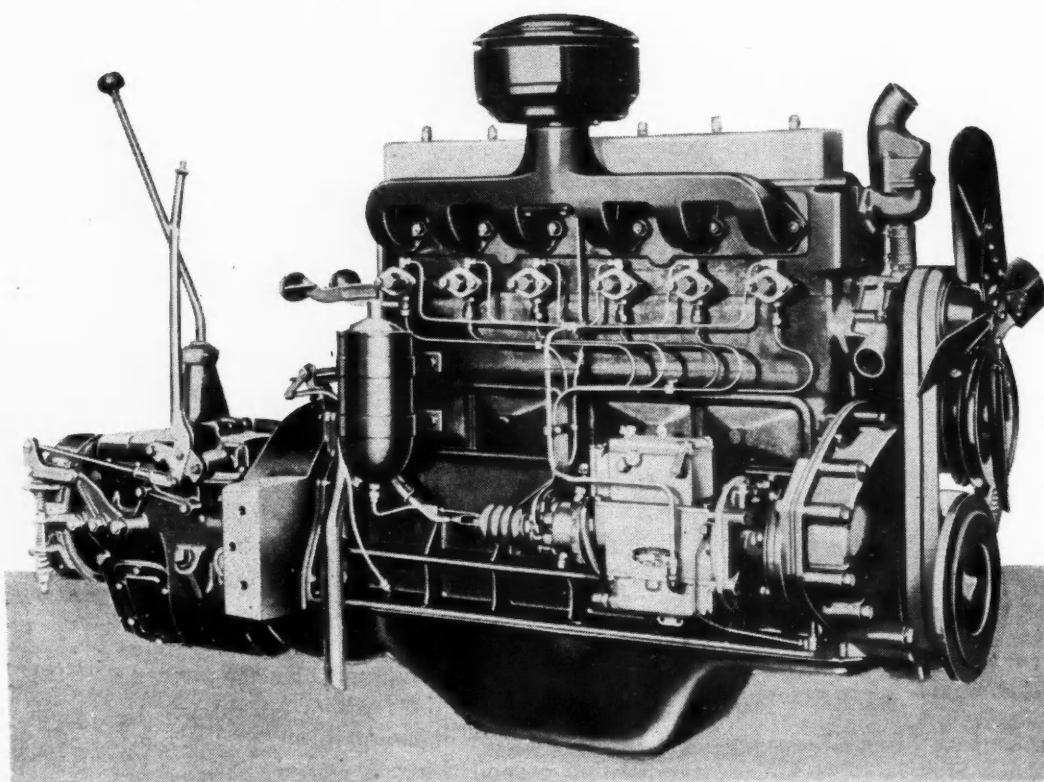
There are seven precision-type replaceable main bearings in the engine, of 3-in. diameter, giving a total projected bearing surface of 36.89 sq. in. The bearing material is copper-lead, and the crankshaft journals are induction-hardened.

Connecting rods have a center-to-center length of 10 $\frac{7}{16}$ in. and are provided with a bronze bushing for the 1 $\frac{1}{8}$ -in. piston-pin, and replaceable copper-lead crankpin bearings of 2 $\frac{5}{16}$ in. diameter by 1 $\frac{7}{16}$ in. length.

Full-pressure lubrication is supplied to all main, lower-connecting-rod, and camshaft bearings, the valve-operating mechanism, and the fuel-injection pump. Oil temperatures are kept down by an oil gallery at the top of the crankcase immediately below the bottom of the cylinder jacket, and by a large oil pan (14 quarts capacity). An oil filter of the replaceable-element type is standard equipment.

The electrical system operates at

Diesel Engine



Dodge six-cylinder four-stroke Diesel engine of 95 hp.

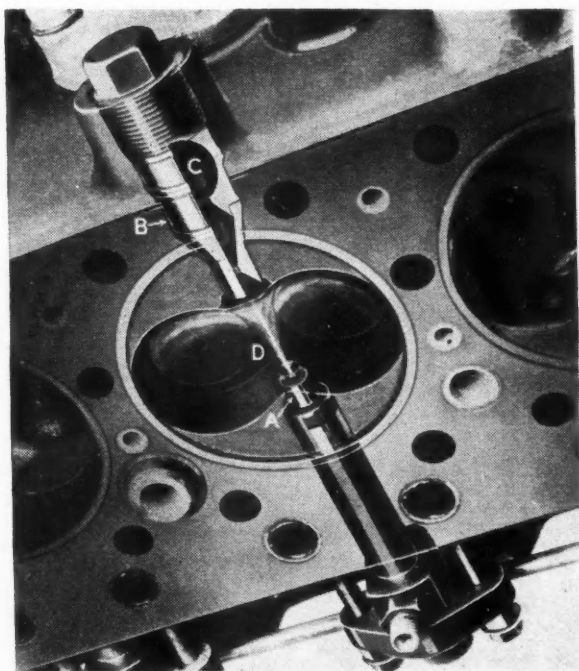
Designed for 3-ton Dodge

24 volts throughout. However, when starting, application of the full voltage is automatically delayed until engagement of the starter pinion is completed. An electric air heater in

of air during the compression stroke. Combustion begins in the main chamber, and as a result the cold-weather starting and high-speed-performance characteristics of the

engine are said to be on a par with the similar qualities of the direct-injection or open-chamber type of Diesel. But most of the fuel is ignited within the confines of the "energy cell," and peak pressures, therefore, are kept from the pistons and bearings, while, on the other hand, a high degree of turbulence is produced by the discharge from the cell. Pintle-type nozzles are employed.

Incorporated in the fuel-injection pump are means for the automatic control of injection timing in accordance with speed, and for regulation of the maximum injection quantity in accordance with speed. Injection is timed to occur at the optimum point of the cycle at all engine speeds, and this, combined with speed-governed regulation of the quantity of fuel injected per cycle is claimed to give the engine un-



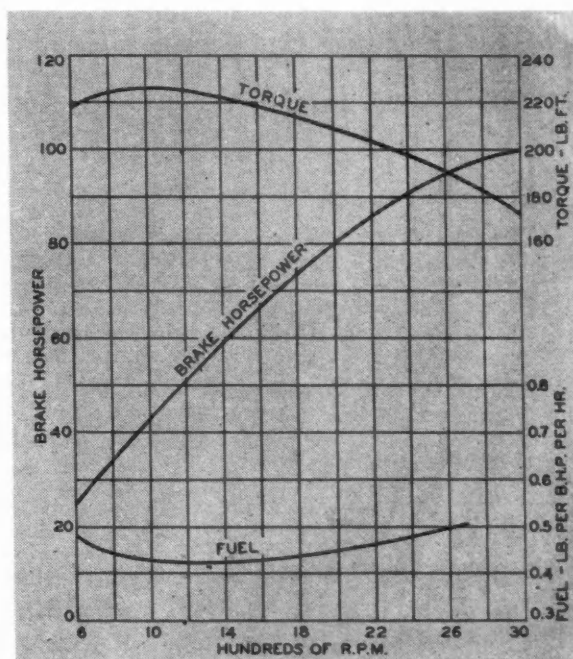
Showing details of the combustion chamber

A jet of fuel from injection nozzle A enters the "energy cell" B. Combustion starts in the main chamber D, the fine globules in the envelope of the jet igniting first, but some of the core of the fuel jet enters the inner chamber C of the "energy cell" and burns there.

the intake manifold, equipped with an automatic time-control switch, facilitates starting in cold weather.

The engine is of the valve-in-head type, in accordance with general Diesel practice, inlet valves having a port diameter of 1.546 in., exhausts of 1.312 in., and both a lift of 0.375 in. The combustion chamber is located in the cylinder head and is of lemniscate shape, with an auxiliary double "energy cell." Fuel is injected across the minor axis of the chamber, a considerable portion of the charge entering the "energy cell" through a venturi-shaped passage simultaneously with the entry

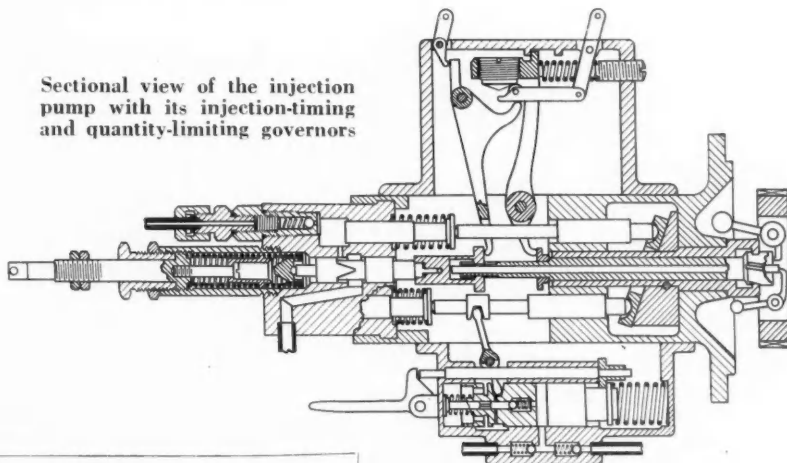
Performance curves of Dodge Diesel engine



usual flexibility and to assure smokeless operation.

The injection pump is of the swashplate-operated type, the axes of its six pump cylinders being parallel with and in a circle about the axis of the pump drive shaft. The six pistons are driven through tappets which are held by spring pressure in contact with a single rotating swash plate. Each cylinder is connected through a port to a central fuel supply chamber. Rotating within the supply chamber is a shaft carrying a valve with a tri-

Sectional view of the injection pump with its injection-timing and quantity-limiting governors



Timken Quality Tubing Immediate Ryerson Shipment

Timken Tubing is not an ordinary steel mill product, but a specialty manufactured to meet exacting requirements. As large users of tubing for the cones and cups of bearings, Timken definitely realizes the value of uniform chemical and physical characteristics, and carefully controls these factors to develop a dense close structure that assures good machinability.

Timken Quality is safeguarded through every step of manufacture. Complete, modern mill equipment is skillfully manned by operators of long experience, and an unusually strong staff of metallurgists is equipped with the most complete laboratory facilities. Each heat of steel is subjected to frequent tests from furnace to finished product, thus insuring uniform high quality whether you order a single tube or a carload.

Ten strategically located Ryerson plants offer you Immediate Shipment of Timken Tubing. Rigid inspection systems, special storing methods, experienced crews, and unsurpassed transportation facilities assure prompt, intelligent service. Draw on the Ryerson plant nearest you.

JOSEPH T. RYERSON & SON, Inc. Plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

RYERSON *Certified* STEELS

angular-shaped section or land which, in passing over each port, closes it. The port is uncovered during the intake stroke of the pump piston and covered only during that portion of the delivery stroke when injection is desired.

The rotating shaft and valve are so arranged that they may be displaced both axially and angularly, the latter displacement creating a change in the phase relationship of the rotating valve and the engine crankshaft. Since the land is triangular in shape, axial movement of the shaft and land controls the length of time during which the port is covered and hence the length of time during which injection takes place. The shaft is moved axially by a mechanical connection to the accelerator pedal, thus controlling the amount of fuel delivered to the engine. It is also subject to control by a centrifugal governor, so that the maximum desirable fuel quantity for any engine speed is not exceeded.

Angular or phase displacement of the rotary valve is controlled by a second set of governor weights. As the engine speed increases, the angular position of the rotating land is set ahead so that in turning, it closes each port sooner than it otherwise would. Since the rotary valve is not a power-transmitting unit, only little friction has to be overcome by the governor in making the phase adjustments.

Operating results obtained during the development period are said to have been most satisfactory, and fuel mileage records are said to show an improvement of at least 40 per cent over the performance of gasoline trucks in comparable service. Indications are that there will be no appreciable difference between maintenance costs with the two types of power.

Precision Is Basic in IHC Engine Plant

(Continued from page 736)

engines are placed either in freight cars or highway trucks for shipment to the Fort Wayne or Springfield truck plant.

Tool Department

The tools, jigs, and fixtures are practically all produced in the plant's tool room, which contains new and modern equipment. Among the tools used here are: Thompson, Blanchard, and Brown & Sharpe surface grinders; Heald internal and Norton external grinders; Pratt & Whitney vertical shaper; G. & L. boring machine; Rockford hydraulic planers; Rockford hydraulic shapers; and a variety of Springfield, Gisholt, Hendey, and American lathes.

All production cutting tools are ground in a central tool-grinding department. Sellers drill grinders and Sellers and Oliver drill pointers are used as well as D & S tap sharpeners. An imposing battery of fourteen No. 2 Cincinnati tool grinders handles most of the small cutters and tools. To facilitate the handling of special work, Thompson, Ex-Cell-O, Norton, Kearney & Trecker and 25W Sellers grinders, as well as a Barber-Colman hob sharpener and a LaPointe broach sharpener, have been installed.

A Gorton mill is used to mill recesses in the flutes of milling cutters, spot-facers and reamers, as well as in other tools for which it is practical to use Carboloy tools. The Carboloy tips are welded into these recesses by using a Firth-Sterling Brazerite furnace.

Quality Control

Control of quality is extremely important in the manufacture of heavy-duty engines which are called upon for trouble-free operation under adverse conditions for periods of service far exceeding anything expected of Passenger car engines. A few examples of quality control are given here as a sampling of the procedure in this plant.

Piston pins are segregated in groups by variations of 0.0003 in. They are made so precisely that checking has to be done with the

P & W Electrolimit gage which readily detects variations of as little as twenty-millionths of an inch.

Cylinder sleeves are checked 100

per cent by means of the Sheffield shadow-gage, holding size, out-of-round, and taper within 0.0001 in.

Pistons are held within a weight tolerance of plus or minus $\frac{1}{8}$ ounce. Crankshafts are balanced within 0.4 in.-oz. Flywheels are balanced within 0.3 in.-oz.

These are but a few random examples on which we could expand almost indefinitely. The important point is that quality control is basic to the set-up whether it be on machine shop operations, sub-assembly, or finished engines.

A CYLINDER bore, even though it has a beautiful, lustrous surface, may still be unacceptable. It may also be slightly out of round, tapered or snaky. It may not be within required diameter tolerances, or it may have surface metal defects produced by preliminary machining or heat treating operations.

MICROFINISH is the one process that accomplishes final control of all these factors:

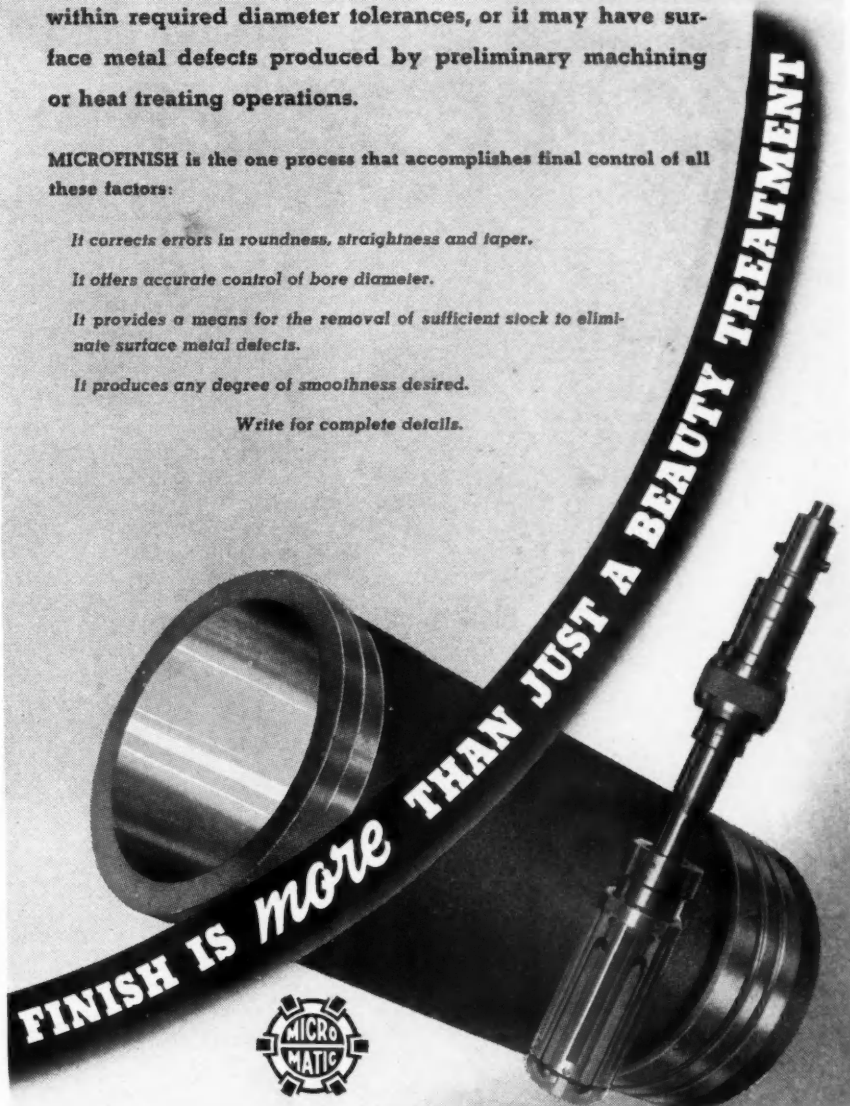
It corrects errors in roundness, straightness and taper.

It offers accurate control of bore diameter.

It provides a means for the removal of sufficient stock to eliminate surface metal defects.

It produces any degree of smoothness desired.

Write for complete details.



MICROMATIC HONE CORPORATION
7401 DUBOIS STREET - - - DETROIT, MICHIGAN

GM Employee Benefit Plans

(Continued from page 723)

(b) Advances are to be repaid without interest by the employee, but only through an opportunity to work. Whenever the employee's subsequent weekly earnings are in excess of 60 per cent of the standard, one-half of the excess shall be applied to the reduction of such Advances, until same have been repaid.

(c) In the event of the death of an employee, any amount due as a result of such Advances, shall be cancelled.

III

LAY-OFF BENEFIT PLAN

An employee not qualified under Section II but who on Jan. 1, 1939, had two years' service or more and is employed at any time during Dec., 1938, or the year 1939, will be eligible.

(a) A credit will be established for each such eligible employee, equivalent to 72 hours' pay at his latest earned hourly rate.

(b) If, in any week while this plan is in operation, an eligible employee's weekly earnings from the Corporation and/or other regular

employment, are less than 40 per cent of his standard weekly earnings, the Corporation will advance to such employee, at the option of the employee, the difference between his actual earnings and 40 per cent of his standard weekly earnings, until he has exhausted the credit established in his behalf—less the amount of Unemployment Compensation to which the employee may be entitled, for that week.

(c) Advances are to be repaid without interest by the employee, but only through an opportunity to work. Whenever the employee's subsequent weekly earnings are in excess of 60 per cent of the standard, one-half of the excess shall be applied to the reduction of such Advances, until same have been repaid.

(d) In the event of the death of an employee, any amount due as a result of such Advances, shall be cancelled.

IV

CONDITIONS GOVERNING

THE OPERATION OF THE PLAN

(a) The Corporation's standard working week is 40 hours, with time and a half pay for overtime.

(b) The standard weekly earnings of an eligible employee are defined as 40 hours' pay at his latest average earned hourly rate.

(c) Advances will be granted upon written application on forms to be provided by the Corporation.

(d) The benefits of the plan are granted exclusively to the employees of the Corporation and wholly owned Subsidiaries in the United States, and are not assignable.

(e) No employee will be granted an Advance who has voluntarily quit or has been discharged for cause; or for any week in which he is absent from work for personal reasons, or because of disciplinary lay-off; or for any week in which he refuses to accept employment offered to him, if he is capable of performing the work; or for any week in which he is idle as a result of a labor dispute in the plant in which he works.

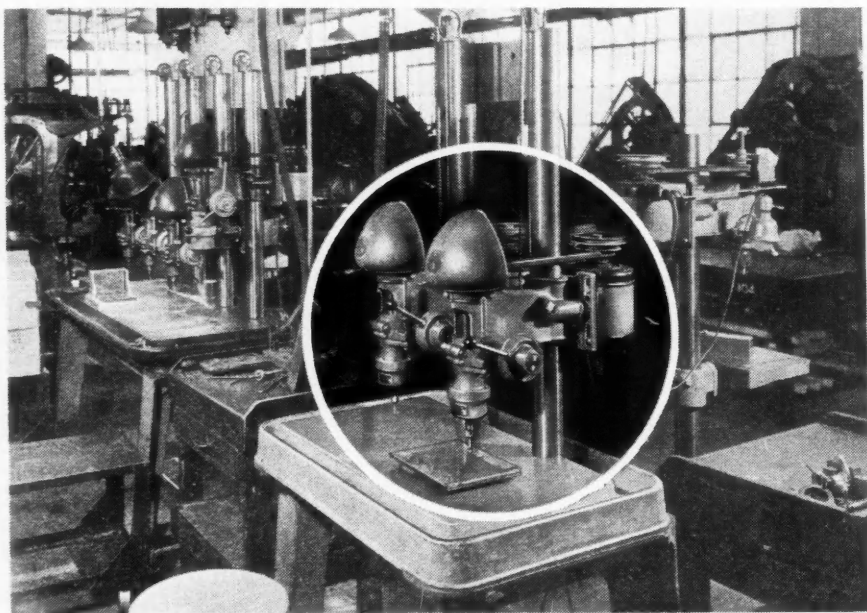
(f) In the event of fire, flood, wars, riots, strikes or other circumstances beyond the control of the Management of the Corporation, which cause Corporation employees to be idle, or in case of a change through legislation, or otherwise, in the standard work week as above set forth, the Corporation reserves the right to suspend in whole or in part or by plants, the granting of Advances under these plans.

V

The Corporation will issue rules and regulations governing the administration of the plans.

TAPPED

120,000 HOLES !



With Only Three Broken Taps

That is the record made with Delta drill presses and tapping equipment with S-48 and 6-32 taps—in steel—at the Hedmen Mfg. Company, makers of the famous F & E Check Protectors. And in this same plant Delta Drill Presses drill 30,000 holes a day, day after day, throughout the year.

Do you know the story of Delta low-cost drill presses—how they are cutting costs for thousands of alert manufacturers?

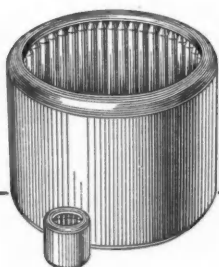
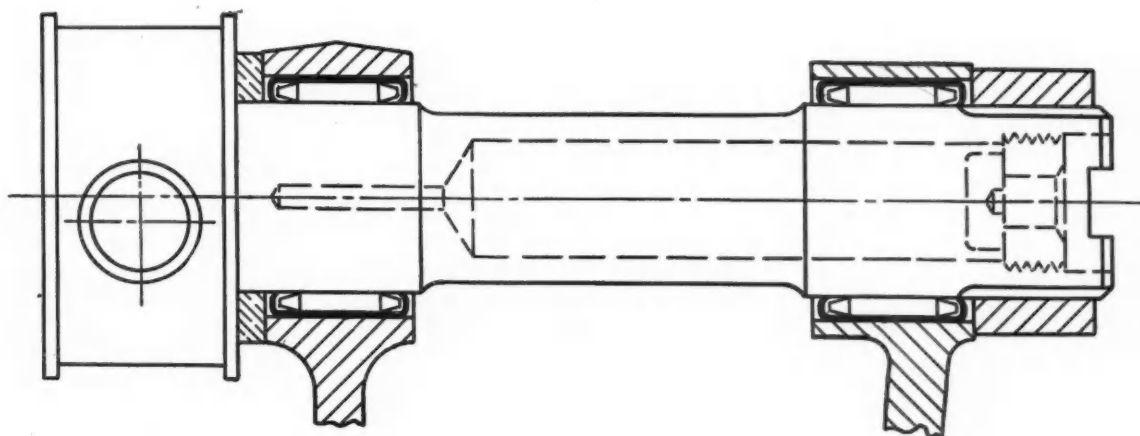
Consider these advantages of the Delta Drill Press—Low first cost, economical operation, low maintenance

cost, portability, flexibility, compactness, and prompt delivery—and see if you cannot cut your production costs by adopting these efficient light power tools. Write today for the full story of other installations, specifications and prices on the complete line of Delta Drill Presses.

DELTA
MANUFACTURING COMPANY
616 E. Vienna Ave., Milwaukee, Wis.

TORRINGTON NEEDLE BEARING

DESIGN AND SERVICE FEATURES



THE TORRINGTON NEEDLE BEARING IN A REAR AXLE BRAKE CAM SHAFT—
A TYPICAL APPLICATION IN WHICH ITS COMPACTNESS SIMPLIFIES ASSEMBLY

BEARING CONSTRUCTION SIMPLIFIES ASSEMBLY

Ideal for Production Line Methods

THE compact construction of the Torrington Needle Bearing materially reduces assembly time and cost in such applications as the truck rear axle brake cam shaft illustrated. The needles are held in place by a hardened retaining shell, *forming a single unit which is easily pressed into place in the housing*—a particular advantage where the use of production-line methods requires the greatest possible ease and speed in assembly.

Further cost economies are effected by the bearing's low unit cost and by the simplification of the housing design. Long axially and small radially, the bearing occupies but little space, and can be mounted in the simplest type of housing.

High Unit Capacity

Even in small sizes, the Needle Bearing has unusually high radial capacity for either rotating or oscillating applications. Its full complement of needles provides many linear inches of contact, and per-

mits heavy loading without overheating or undue wear.

The turned-in lips of the hardened retaining shell exclude dirt and form a reservoir for lubricant, holding ample quantities for long periods of operation without service attention. The needles actually rotate in a bath of the lubricant at all times.

The Torrington Engineering Department will cooperate in laying out bearing applications. Their long experience

is at the service of manufacturers wishing to utilize the advantages of this bearing in their products. Further information is given in the Torrington Needle Bearing Catalog, available on request. Write for Catalog No. 7.

The Torrington Company
ESTABLISHED 1866
Torrington, Conn., U.S.A.

Makers of Ball and Needle Bearings

Branch Offices in all Principal Cities

TORRINGTON

NEEDLE BEARING

Progress in the Oil Industry

(Continued from page 739)

thinking in a complete vacuum and entirely disregard that vast body of experience which proves that they are wrong. Experience and experiment are about the only things on which we can confidently rely. De-

tailed investigation and scientific experimentation are modern processes that the ancient thinkers would have regarded with scorn, but they have disproved much of what ancient wisdom accepted as fundamental truth.



Distinguished

Enjoy every luxury and convenience of fine living at The Drake. Located on Chicago's famous Gold Coast, convenient to the shopping and business centers. Overlooking Lake Michigan.

A. S. Kirkeby, *Managing Director*

The Drake

LAKE SHORE DRIVE • CHICAGO

On this point one illustration has always appealed to me:

From the beginning of speculation about physics it was believed that bodies of different weights would fall at speeds in proportion to their weights; a two-pound weight would fall just twice as fast as a one-pound weight. That was accepted as obvious and logical for countless centuries. Then one day Galileo climbed up to the top of the leaning tower of Pisa with a two-pound weight in one hand and a one-pound weight in the other. He dropped them both at the same instant and observed that they reached the ground also at the same instant. That was about the beginning of the formulation of the laws of motion and of gravitation.

What we need nowadays is some Galileos of economics and sociology to drop a few weights in the right places; to examine and to compare the experience of the ages with the various panaceas that our economic and social planners are dishing out to us. In the light of that experience it is difficult to give serious consideration to those who today solemnly argue that poverty is caused by over-production; that an economy of scarcity will bring prosperity; that if we will only work fewer hours all of us will be better provided for. They urge us to hobble the scientists and to muzzle the inventors, lest progress destroy the jobs. Our twentieth-century sophists kill off the little pigs in order to insure our supplies of pork. They heap paralyzing tax burdens on industry and enterprise just when they want industry and enterprise to expand. And they decree that the farmer and all the rest of us shall produce less in order that we shall have more.

We may speculate with some interest as to what might have been the attitude of a National Planning Board in 1900, if one had existed at that time, toward the automobile and petroleum industries. There were then in operation in this country some 8,000 motor cars, consuming 80,000 barrels of gasoline in a year. That is just about enough gasoline to keep the cars of today in operation for one hour and a half. Let us imagine Mr. Ford, with his great vision of the automobile's future, appearing before that board and asking that in its program for the next two or three decades it provide a few billions of dollars of capital, along with the necessary labor and material, for his industry. The board would have recognized in Mr. Ford a mild lunatic. They would have asked him where he expected

to get the gasoline for all those cars; and would have pointed out that neither the gasoline nor the crude oil from which to make it was anywhere in sight. And they would have rejected Mr. Ford's demands. A sophisticated public would have laughed at Ford when the board set down genius as insanity and inventive ability as lunacy; and that would have ended all foolish talk about horseless carriages and flying machines.

But fortunately for those 20,000,000 families in this country who derive pleasure and satisfaction from the operation of their cars, there was no such board in 1900. And so, Mr. Ford, not worrying about where his gasoline was coming from, went right ahead building more cars and better cars, until presently he was turning out over 1,000,000 cars a year.

Fortunately also for the oil industry, there was no such board, for the industry went right ahead drilling more wells and deeper wells, and sometimes finding oil. Oil men brought technology to their assistance in the form of geology and geophysics, and by their aid discovered new oil fields. In order to get the gasoline into the consumer's car at the lowest possible cost, they built tens of thousands of miles of pipe lines, which carried the crude oil from the wells and stored it at central points. They invented, developed, and built hundreds of great tank steamers, which have now become the lowest cost transportation units in the world. They built finer, larger, more complex and more efficient refineries; and then they built more pipe lines to take the gasoline from the refineries, where it was eventually loaded into tank trucks and delivered to those hundreds of thousands of filling stations throughout the land. And so, the oil industry, doing each year those things which would have been impossible the year before, was always able to keep just a step ahead of the thirst for gasoline of those multiplying millions of automobiles.

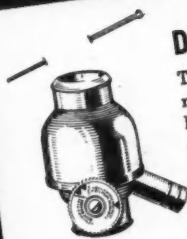
We cannot but view with concern the tendency of government to control more and more of industry and thus continually to narrow the field that is left open to free enterprise. The railroads, with their rates, wage scales and finances under control of government; the other public utilities; the banks, insurance companies and investment concerns; and the merchant marine—these are all practically closed to free enterprise and the operation of natural economic law. Even in that most elemental

and least integrated of all industries—agriculture—we see that the hard, unimaginative authority of government, experimenting this year with one nostrum and the next year with another, has produced all the symptoms of creeping paralysis.

This persistent effort to bring industry, business, commerce, enterprise, under government domination is a flat denial of all the lessons of the century and a half of the industrial age. Within that short period the institutions of political democracy and economic freedom

have grown up side by side. They have grown together and lived together; their epoch has been marked by the emancipation of the common man and by humanity's most impressive advances in the arts and sciences. Free enterprise has always made the greatest contribution to recovery from depressions by lowering the prices at which its products are sold. And just to the extent that expanding government controls narrow the area within which enterprise and initiative are free, to that extent they add to the burden that must be

Engineering Memo



DEPENDABLE *Dole* THERMOSTATS

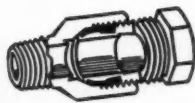
The Dole Line of Automotive Thermostats includes models for motor block and hose line installation... both Poppet and Butterfly Types... with and without nipples for hot water heater connection. All models assure reliable automatic control of engine temperature under varying road, load and weather conditions... are proof against leak, seepage and wear.

DEPENDABLE THERMOSTATIC BI-METAL

Dole Thermostatic Bi-Metal... made to exacting specifications by time-tried procedures that assure complete uniformity of quality... can be purchased in (1) Sheets up to 14 inches wide; (2) Strips any width; (3) Coils, as long as 1,000 feet; (4) in diversified fabricated parts such as spiral or helical coils, hairpin or U-shapes, flat strips, etc.



DEPENDABLE *Dole* FITTINGS



and Special Parts
Compression couplings for all tubing connections and a complete assortment of water line and hose parts for automobile hot water heaters... all built and factory tested to withstand severe vibration and strain. Also special brass parts from customer's blueprints... to his specifications.

THE DOLE VALVE COMPANY
1901-1941 CARROLL AVENUE CHICAGO, ILLINOIS
DETROIT OFFICE: GENERAL MOTORS BUILDING

DOLE

THERMOSTATS

borne by those who are still their own masters.

In conclusion, I appeal to you men of this great industry to stand firm in defense of the American system of free and competitive enterprise. The truth is that no economic planning authority could ever have foreseen, planned, plotted, and organized such an amazing spectacle of industrial progress as the world has witnessed in the last century. No trust or combination, private or governmental could have accomplished it. It could have been achieved only un-

der conditions of wide-open invitation to all the genius, inventive ability, organizing capacity, and managerial skill of a great people.

Nobody must be barred, no invention rejected, no idea untried; everyone must have his chance; and under our American system of free enterprise and equal opportunity everybody gets just that chance. It is our freedom that has brought us to this high estate—intellectual freedom, religious freedom, political freedom, industrial freedom; freedom to dream, to think, to imagine, to ex-

periment, to invent, to match wits in friendly competition; freedom to be an individual.

That is our great American heritage. With so many political witch doctors abroad in the land teaching communism, fascism, planned and dictated economics, governmental paternalism and all the other isms, I urge you to guard well that heritage and to turn a deaf ear to all their sophistries. When a people come to look upon their government as the source of all their rights, there will surely come a time when they will look upon that same government as the source of all their wrongs. That is the history of all planned, dictated economics. That is the history of tyranny. To each of us is assigned a part to play in the great drama of life; and we can only plan our parts with the greatest measure of perfection as free, unhampered individuals. Surely it is not thinkable that, in the light which shows through this twentieth century, a great progressive people will be beguiled into turning back to the ways of controlled economics and dictated social programs.

Stop this man

FROM A COMPENSATION CLAIM



This man is in danger. He is in contact with cutting oils. Dangerous pus-forming germs—germs which enter cuts and scratches on arms and hands, lurk in cutting oils. Quickly pimples and boils appear, demanding medical care. Thus another worker goes home, laid up with oil dermatitis. And another claim for compensation must be paid.

OIL DERMATITIS MUST BE PREVENTED

How can you stop paying for losses that are costing plant owners and insurance companies millions of dollars each year? Very simply. Just *sterilize* all cutting lubricants with Derma-San. One pint of Derma-San added to 35 gallons of cutting lubricant kills oil dermatitis germs *before* they reach your workers.

DERMA-SAN IS DOING A REAL JOB

Thousands of plants use Derma-San because they cannot afford to be without it. They know that using Derma-San is a safety measure that promises genuine protection. Used in *your* plant, it will save you money. It will help keep your workers on the job . . . bring increased efficiency. It may also bring reduced insurance premiums. You need Derma-San protection *now*. Order a drum — *today*.

The HUNTINGTON LABORATORIES Inc.
DENVER HUNTINGTON, INDIANA TORONTO

DERMA-SAN

D I S I N F E C T A N T

Boeing-TWA in Contract Suit

(Continued from page 720)

plaint did not set forth any explanation as to why the certificate had been delayed.

Boeing had posted a \$1,500,000 performance bond under the contract, TWA's reply states, and the base price of each of the six planes was set at \$270,000. The six ships involved in the suit were modifications of the Boeing "flying fortress," a four-engined plane developed by the Army. The sale price was \$300,000 a ship or a total of around \$1,800,000.

Originally the ships were scheduled for delivery to the airline in September, this year, but Boeing was unable to meet the delivery date, it is understood.

By the terms of the agreement under which five airlines underwrote a portion of the experimental cost of the Douglas DC-4 transport developed by Douglas Aircraft Company, Santa Monica, each agreed not to purchase a transport weighing more than 45,000 pounds until after the DC-4 had been tested. By the purchase of the Boeing ships, which weigh some 43,000 pounds, Transcontinental & Western Air would have been the first transcontinental airline to install four-engined equipment and would have had a jump of from one to two years on its competitors.